AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

APRIL 1, 1954

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Foreign Barriers to Motor Vehicle Exports
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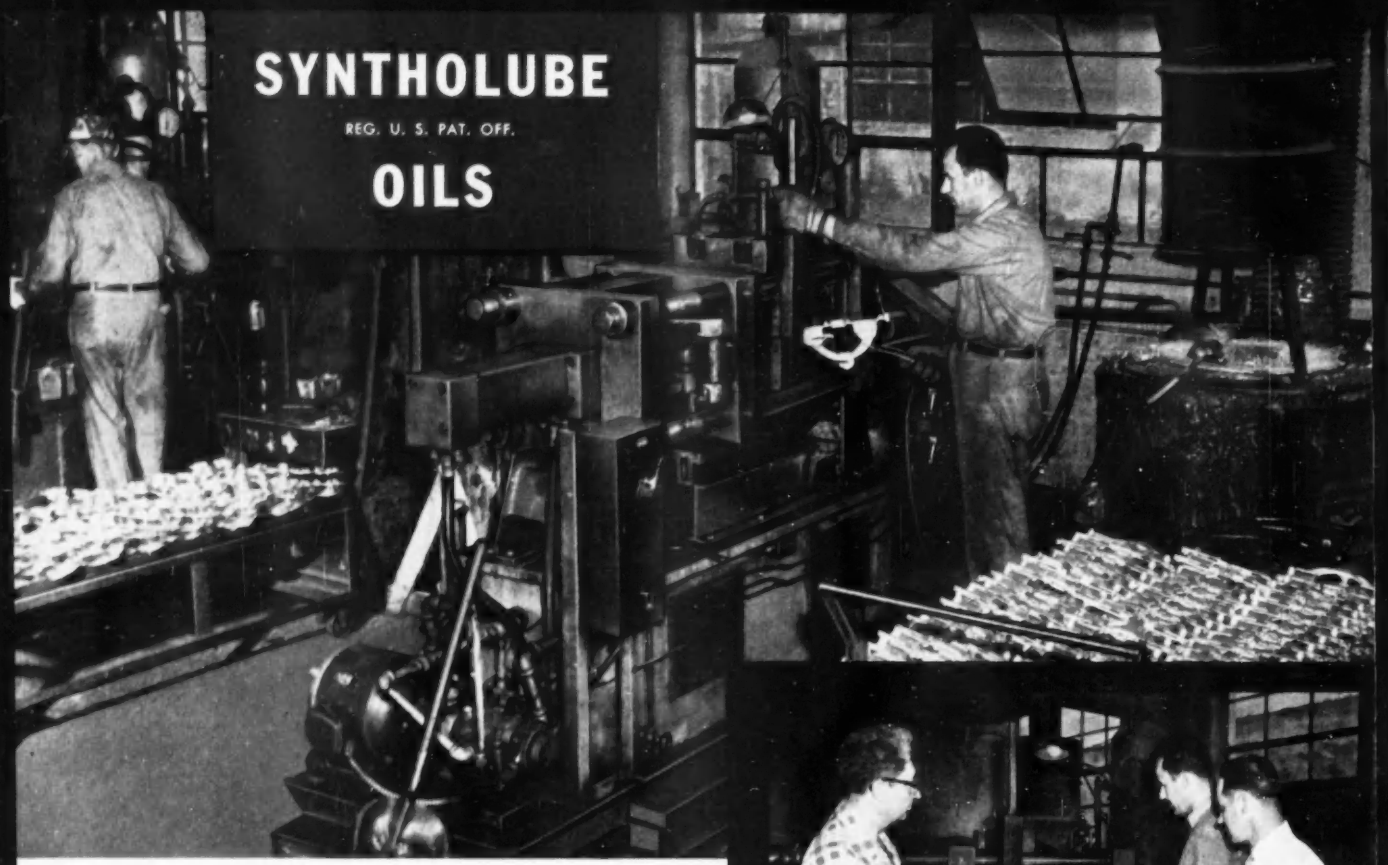

Beats heat in die casting machines . . .

● The Atlantic Die Casting Company specializes in aluminum die casting. Using hydraulic machines of its own design, this company turns out amazingly intricate parts at a high rate of production. But it was not always easy going.

There had been a problem of lubrication. The exceedingly high temperatures necessary for die casting made it difficult to lubricate machine parts in the area of the heated dies. Various expensive and complicated lubricating mixtures were tried. Under the high temperatures, the lubricants thinned and did not cling well to the hot surfaces. Oxidation of the lubricants produced deposits. Resulting troubles: sticking of machine parts, particularly ejector pins; staining of aluminum castings, down-time for cleaning.

Consulted on this problem, a Standard Oil lubrication specialist recommended the lubricant that had been developed by Standard Oil for just such high temperature applications: SYNTHOLUBE Oil.

This unique product has made short work of the lubrication troubles. It does not "run" from hot surfaces. Its unusual depolymerizing characteristic has prevented the formation of troublesome deposits. In addition to other lubricating benefits, SYNTHOLUBE has eliminated the expense of using costly lubricating mixtures.

Whatever your lubricating problem or need, you'll find that a Standard Oil lubrication specialist has the engineering ability and the petroleum product to help you. You can reach the specialist serving your area of the Midwest by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 So. Michigan Ave., Chicago 80, Ill.

Mr. Simon Slutsky (left), co-owner of Atlantic Die Casting Company, and Mr. L. J. Loomis (extreme right), Standard's lubrication specialist, watch machine operator use the somewhat unique spray method devised to apply SYNTHOLUBE Oil to hot and hard-to-lubricate parts of die casting machine.

STANDARD OIL COMPANY STANDARD *(Indiana)*

new engine equipped with...

COTTA TRANSMISSION repowers dragline at low cost!

Dragline operated by prominent Eastern city was repowered by Mack Boring and Parts Company, Newark, New Jersey.

When the utility of heavy capital equipment can't justify its replacement, as in the case of this municipal dragline crane . . . or when new equipment is difficult to get . . . rebuilding often gives you "like new" performance at low cost.

This prominent Eastern city modernized its dragline, adding years of trouble-free service life with a minimum capital outlay, by installing a new engine equipped with a Cotta, Model HMA, Heavy-Duty Transmission.

Cotta transmissions are designed for around-the-clock, efficient operation on original equipment or replacement applications such as cranes, drillers, locomotives, shovels, generators, pumps and other heavy-duty machinery.

Engineers specify Cotta when they want extra "beef" . . . when heavy, intermittent operation shocks gears and overloads shafts, keyways and bearings . . . and when costly repairs and down-time must be eliminated.

When heavy equipment requires a low cost power transmission, reduction unit or gear case with these "rugged" characteristics "built in," Cotta engineers will help select the right unit to give you outstanding performance.

Designed For

A Broad Range of Ratios

And Input Torques

From 150 to 2000 Foot Pounds

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA HEAVY-DUTY TRANSMISSIONS

"Engineered-to-order"

Nickel Alloy Iron helps multiple nut runners increase Unit Production

Watch this compact tool speed up units for the assembly line!

Made up of Ingersoll-Rand Multivane torque motors, it runs 4 nuts simultaneously.

The powerful little vane air motors run smoothly in their cylinders which are machined from a nickel alloy cast iron. Use of nickel in parts such as these makes possible increased toughness and resistance to wear, facilitates heat-treatment as well as cutting down the amount of porosity. As a result, they contribute to substantially more hours of tool use... with corresponding reductions in maintenance and non-productive labor costs.

Your metal problems may be different, but the many standard grades of alloys containing nickel permit selecting the particular type which provides the best combination of properties for specific fabrication and service demands. Send us details of your problems for our suggestions.

Running 8 differential case cap screws in two passes with a torque of 35-39 ft. lbs. at the Timken Detroit Axle Division, Rockwell Spring and Axle Company, Detroit, Mich. The individual nut runners are so arranged that positioning on one nut automatically engages the remaining nut runners in the multiple tool. Thus, a high level of automation is reached. This tool is a product of Ingersoll-Rand Company, New York, N. Y.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

A CHILTON MAGAZINE

AI AUTOMOTIVE INDUSTRIES

PUBLISHED SEMI-MONTHLY

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NBP National Business Publications, Inc.

ABC Audit Bureau of Circulations

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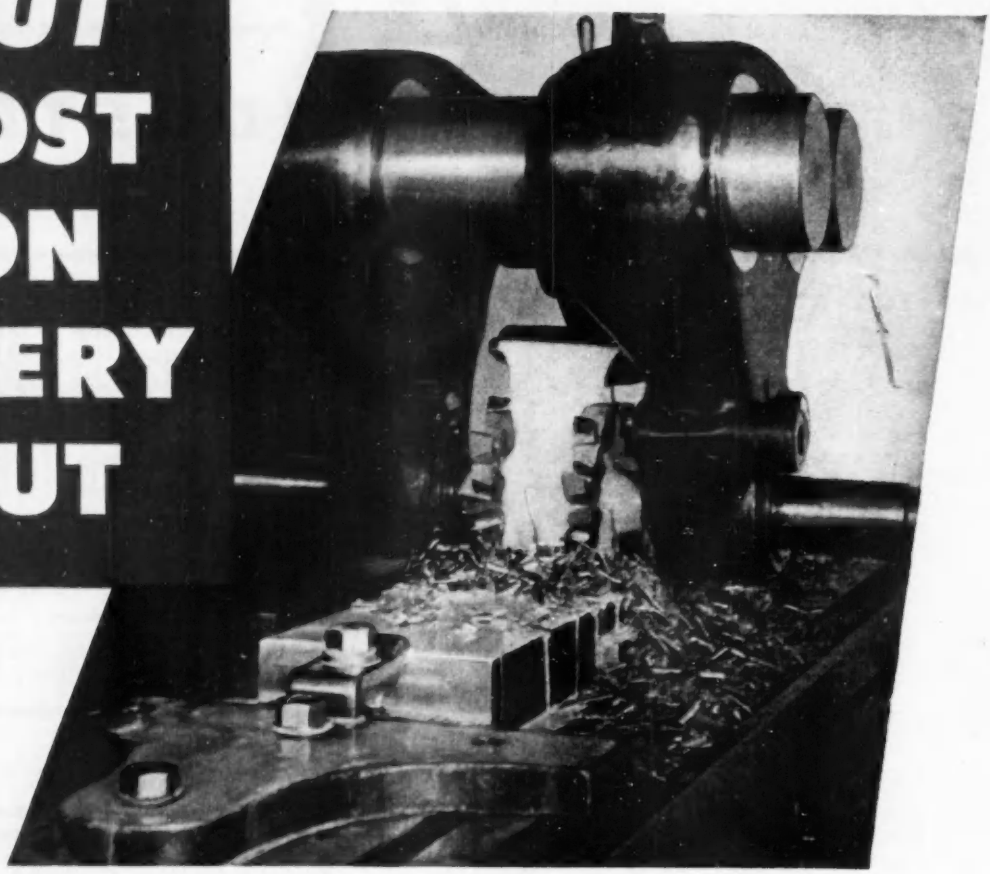
CUT COST ON EVERY CUT



When you do your machining with *Texaco Cutting, Grinding or Soluble Oils,* you can count on

— GREATER PRODUCTION — BETTER FINISH
— LONGER TOOL LIFE — FEWER REJECTS

These benefits add up to a *lower unit cost* for whatever you're producing.

Let a Texaco Lubrication Engineer help you select the *Texaco Cutting, Grinding or Soluble Oils* that will help you do *all* your machining better, faster and at lower cost.

For hydraulically controlled or operated machines, your Texaco Lubrication Engineer will recommend *Texaco Regal Oil R&O* as hydraulic medium. This turbine-grade oil keeps systems free from sludge, rust and foam . . . assures smooth, uninterrupted operation.

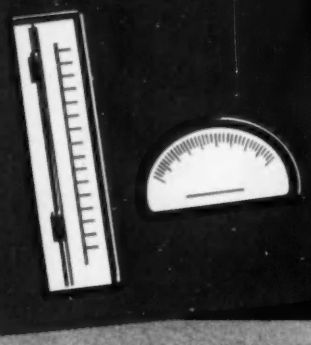
Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

VISIT TEXACO BOOTH 831, TOOL ENGINEERS' SHOW, PHILADELPHIA, APRIL 26-30

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

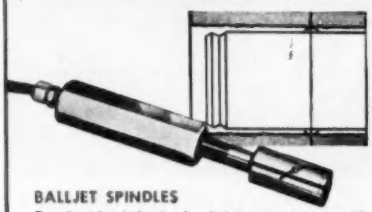
TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.



Modernize FOR LOW COST PRODUCTION with Newest Developments In Air Gaging

Already these newly developed practical precision tools are helping produce more and better products at lower cost in innumerable plants throughout the world.

Space restrictions here preclude anything more than the briefest description. Phone, wire or write for specifications, prices and delivery—or call the Sheffield sales engineer in your vicinity.



BALLJET SPINDLES

For checking holes having finishes rougher than 65 micro-inches, for porous parts, narrow lands or checking to the very end of a hole. Setting is made with gage blocks and a Standard Calibrator. NO MASTER SETTING RINGS REQUIRED—not even one.

ADJUSTABLE SPINDLE KIT

One, two, three or four spindles may be quickly assembled from components in the kit, for any size between 1 and 3 inches. Gage blocks are used to set for size and to calibrate air gage for amplification.

ADJUSTABLE AIR BORE GAGE

A light, high precision (2,000 to 1 amplification) self-centering bore gage that is easily adjustable from 3" to 12" in diameter. Calibrated by a Standard Calibrator and gage blocks.

AIRETEST INDICATOR

Replaces an indicator where more accuracy and higher amplification are required. Always gives precise readings regardless of the direction of approach. No lag—no gears—nothing to wear out of adjustment. Amplifications up to 5,000 to 1.

AIRELECTRIC HEAD

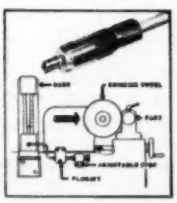
Converts air pressure variations at the gaging contact into electrical impulses which actuate classification and segregation mechanisms or machine control devices. Accurate to a fraction of a "tenth".

ELECTRO-PNEUMATIC UNIT

A self-contained unit of Airelectric Head, indicating dial and signal lights. Easily mounted on the machine to control machine operation by precision measurement of the machined surface. Makes machining automatic. Also used for automatic gaging and segregating.

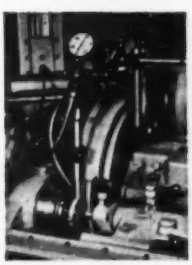
PLUNJET FEED GAGE

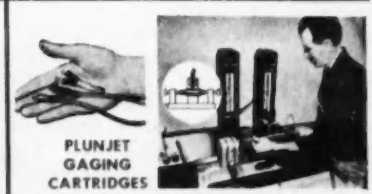
The key element of the machine "Feed Gage" which eliminates error due to feed screw wear. Also, due to the high amplification, makes it easy to manually control the feed to fractional "tenths".



PLUNJET CALIPER TYPE GAGE

Air Gaging Cartridges are used with Caliper Gages for continuous sizing of work on external grinders. Dial is used for approach —PLUNJET brings to final size.





PLUNJET GAGING CARTRIDGES

Precise, low-cost gaging elements which you may incorporate in your own gaging fixtures singly or in multiple to measure practically any dimension or geometrical relationship, with tolerances ranging from .0005 to .100.

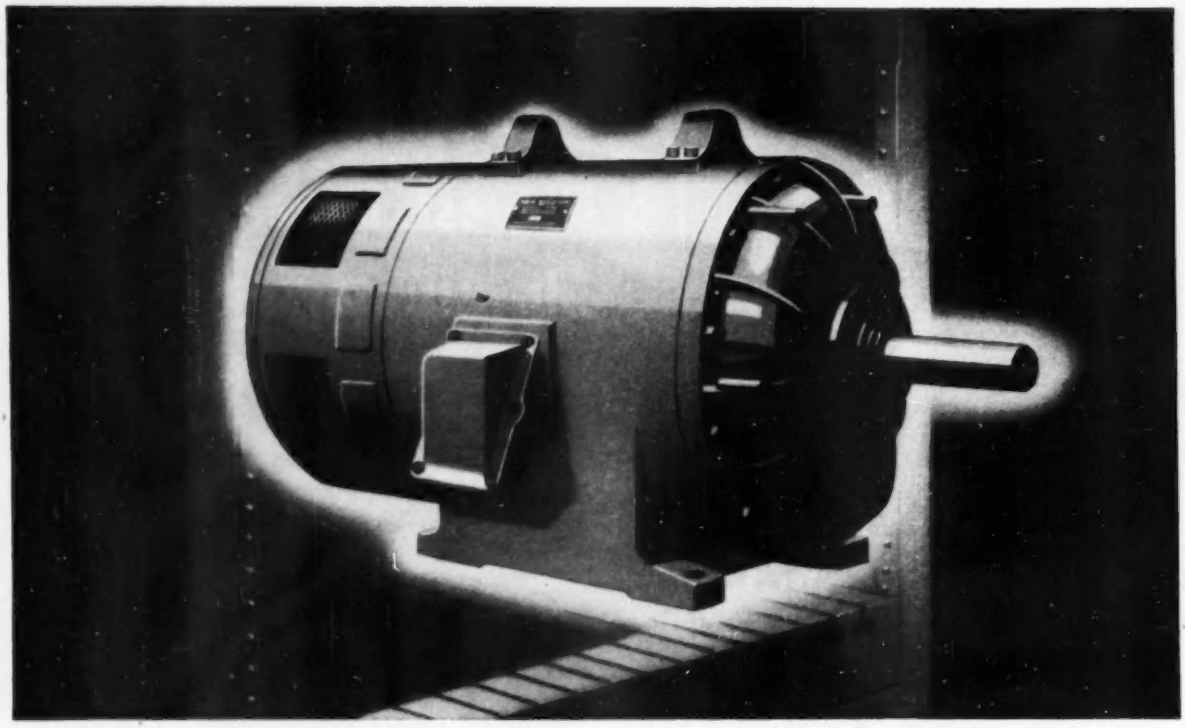
GAGE DIVISION, *The Sheffield Corporation*
Dayton 1, Ohio, U.S.A.

6756

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

PHONE, WIRE OR WRITE



INSTALL IT AND FORGET IT . . .

New G-E Totally Enclosed Press Motor Is Built for the Really Tough Press Jobs

NEW SELF-VENTILATING SYSTEM REQUIRES NO SEPARATE BLOWERS OR FILTERS

The new G-E Type KRX induction motor, designed specifically for service on large presses, has solved the problem of rotor heat without going to separate ventilating blowers or excessively large frame sizes.

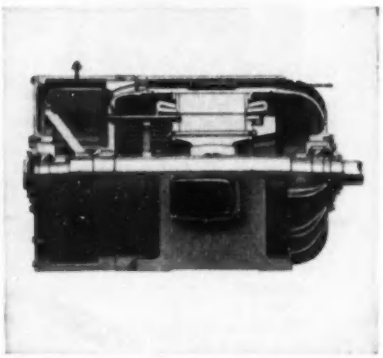
Less maintenance is required because the KRX motor is self-ventilated with no filters to change or clean! The dirt and oil-laden air of the press room is kept out of the motor by positive totally enclosed construction.

Shock and vibration protection for the most severe press service is provided by the rugged, cast-iron frame and rigidly bolted end shields.

Greater efficiency results from the use of this G-E motor, because less power is required to move ventilating air—more useful power is available for the job.

Easier handling results from this one-unit design which is up to 50% smaller and lighter.

For more information on why this G-E motor has already proved so successful in many automotive plants, ask your G-E Apparatus Sales representative for Bulletin GEA-5986, or write *Section 830-3, General Electric Company, Schenectady 5, New York.*



G.E. SOLVED ROTOR HEAT PROBLEM by extending rotor bars to form a radial fan which dissipates heat outside stator assembly. Heat is carried directly to outside—does not build up in the stator.

Progress is our most important product

GENERAL ELECTRIC

What are the 4 key factors in selecting a gasket material?

17 helpful sections, including:

- Designing flanges for efficient sealing
- Sealing with confined resilient gaskets
- Designing gaskets to reduce costs
- Effect of gasket widths on compression
- Relation of gasket thickness to load
- Design problems peculiar to rubber gaskets
- Effect of surface conditions on gaskets

ARMSTRONG'S GASKET MATERIALS

FREE FOR YOUR FILES

When you want to find the *four key factors* in selecting a gasket material, or need to know what Armstrong materials meet current specifications, see "Armstrong's Gasket Materials." Newly revised for 1954, this 24-page manual offers data essential to anyone concerned with gaskets or joint design. It includes suggestions on gaskets and joint design . . . gives details on various types of gasket materials . . . and offers important specification data. See it in Sweet's product design file, section 3h. For your FREE COPY, fill in and mail the coupon below.

SEND COUPON TODAY

Armstrong Cork Co., Industrial Div.,
7104 Imperial Ave., Lancaster, Pennsylvania

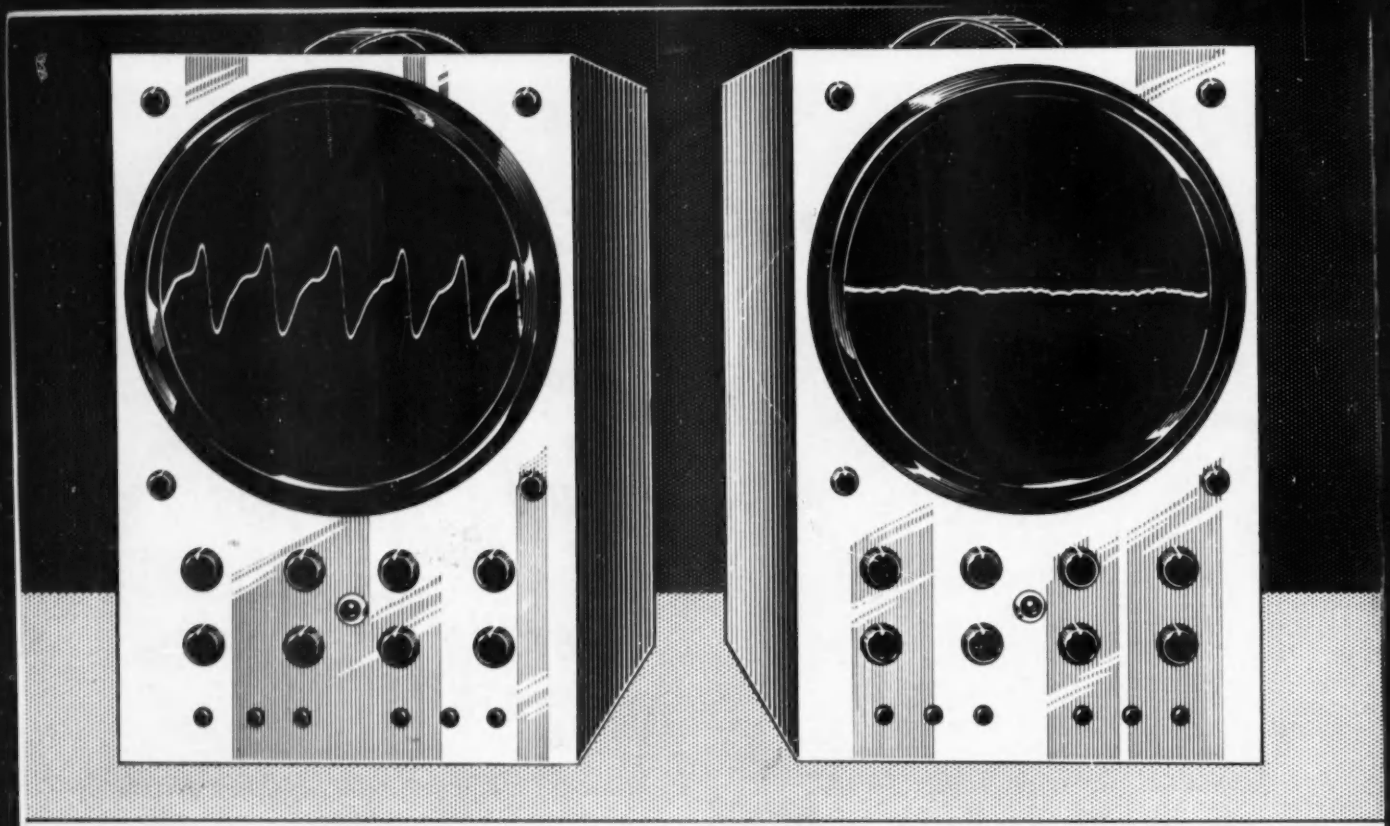
Please send me your new 24-page gasket manual.

Name _____

Company _____

Address _____

_____ *Position* _____



WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008" jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-4.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY

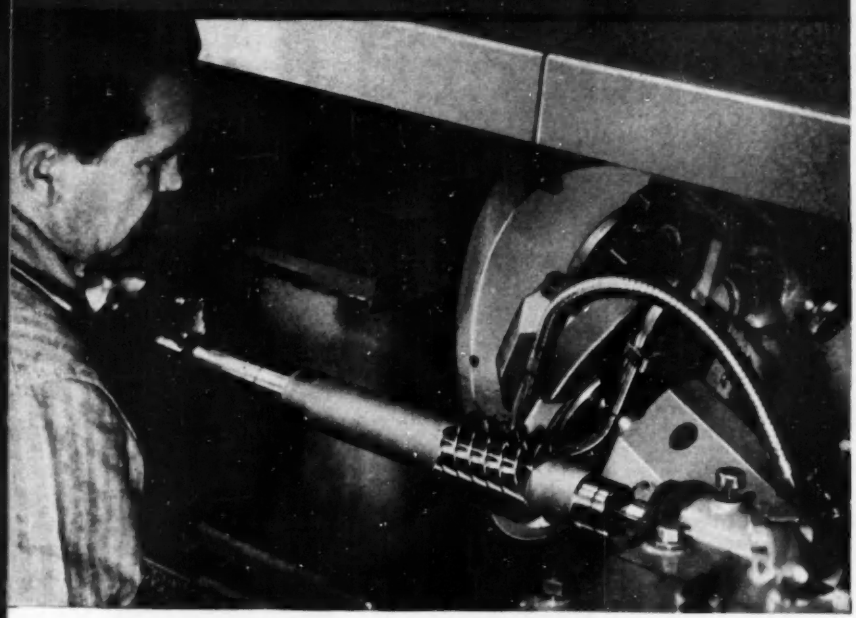
SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of the famous Blue Sunoco Gasoline and Dynalube Motor Oils

Grinding 5-Start Worm with 4" Lead

EX-CELL-O



In the photograph at the left the operator is grinding a worm shaft for use in a special machine. The part is about 22" long and the worm is 4½" long, 3.430" O.D., has 5 starts, a pitch of .800", a lead of 4" and a tooth depth of .5454". The worm was ground in two operations on a standard Style 36 Thread Grinder. It was rough ground from the solid, hardened, then finish ground.

For complete information and specifications on the Style 36 and other Ex-Cell-O Thread Grinders contact your local representative or write today to Ex-Cell-O.

XLO
EX-CELL-O for PRECISION

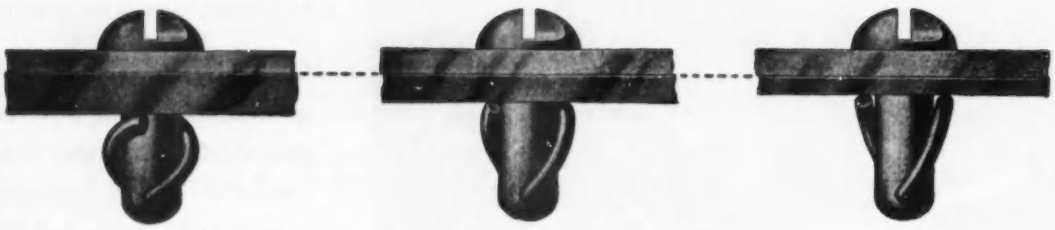
A COMPLETE LINE OF PRECISION THREAD GRINDERS

EX-CELL-O CORPORATION • Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

53-35

This fastener works through thick and thin!



Spring-Lock—the easy-to-use removable fastener for modern designs—works whether panel thicknesses run over or under specifications! Spring wire deflects automatically to handle greater or lesser thicknesses. Spring-Lock's design flexibility makes it more than a fastener: it can be adapted as a shelf support, door strike, knob or any similar panel-mounted device. Many standard shapes and sizes of Simmons Spring-Locks are available from stock.

SIMMONS FASTENER CORPORATION

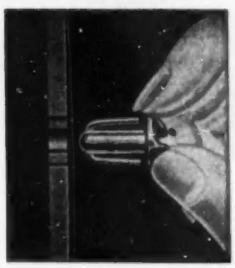
1749 North Broadway, Albany 1, New York

Simmons

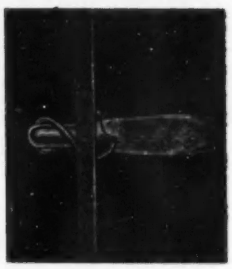
QUICK-LOCK
SPRING-LOCK
ROTO-LOCK
LINK-LOCK
DUAL-LOCK

JUST OUT!
NEW 36-PAGE CATALOG WITH APPLICATIONS
SEND FOR IT!

HERE'S HOW SPRING-LOCK WORKS



1. *Insert fastener.*



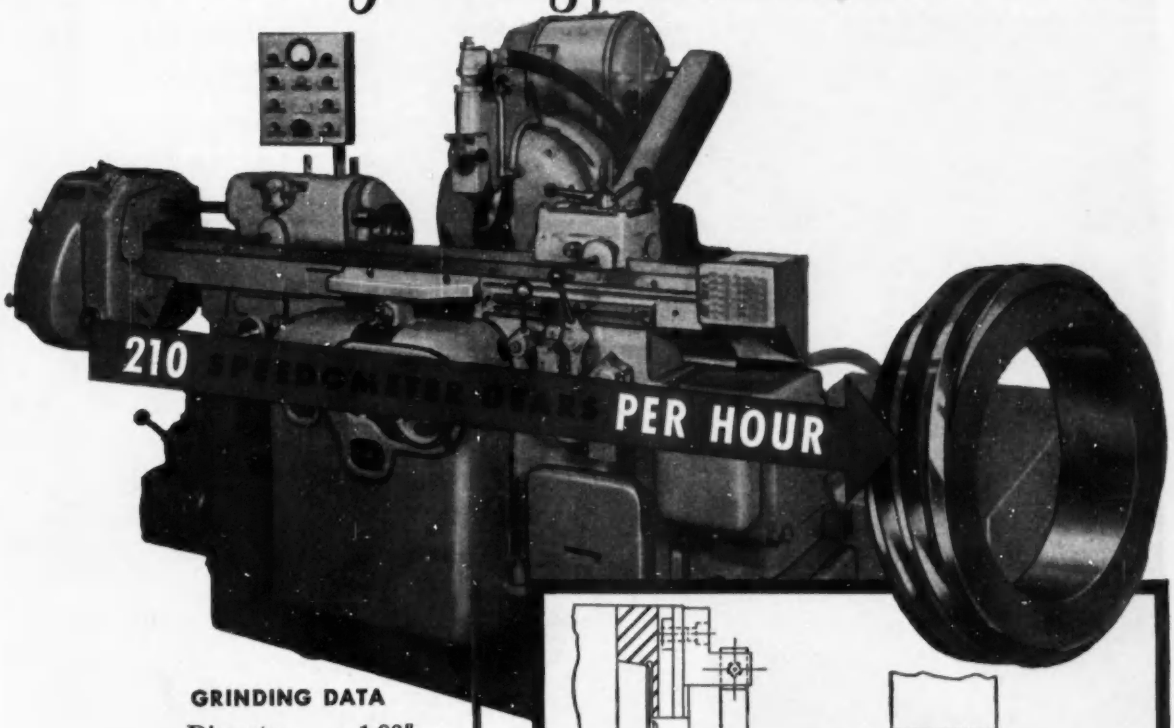
2. *Half-turn locks it in place.*

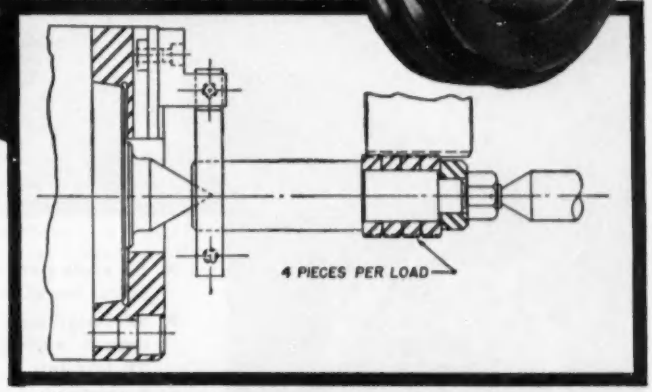
With production costs on the uptrend, you can figure on Spring-Lock as an assembly time and money-saver, because:

- **Installation is BLIND**
- **Installation is EASY: no special tools are needed**
- **Installation is QUICK: a half-turn locks it in place**
- **Installation is SECURE: the *spring* steel *locks* the fastener, resists vibration**

Send for details and samples, or write us about *your* fastening problem.

Multi-ribbed grinding BOOSTS production!





GRINDING DATA

Diameter . . . 1.93″
Pitch . . . Approx. 6
Form . . . Worm
Thread . . . 4-Start
Lead . . . .6797″
Helix Angle . . . 6° 37′
Thread Length . . . 1⅞″
One way grinding
Stock removed . . . .089″
Crush Dressing of Wheel

AUTOMATIC WORK CYCLE

Automatic In Feed
Automatic Sizing
Automatic Wheel Trueing
Automatic Lubrication
Automatic Coolant System

These four-start worms are ground — four at a time in a single pass — from the solid. A multi-ribbed wheel is crush-dressed every 48 pieces (twelve arbor loads). The finish on these parts — and the rate of production — exceed those possible by any other methods.

This is a typical example of how the FULLY AUTOMATIC WORK CYCLE of Jones & Lamson Automatic Grinders assures rapid metal removal, accuracy of form and quality of finish.

P.S. Because of today's challenge for increased production at a higher degree of accuracy, Automatic thread and Form Grinders are replacing other methods for producing this class of work.

On the basis of increased quality and *more production per labor hour*, we invite the opportunity to improve upon your existing methods.

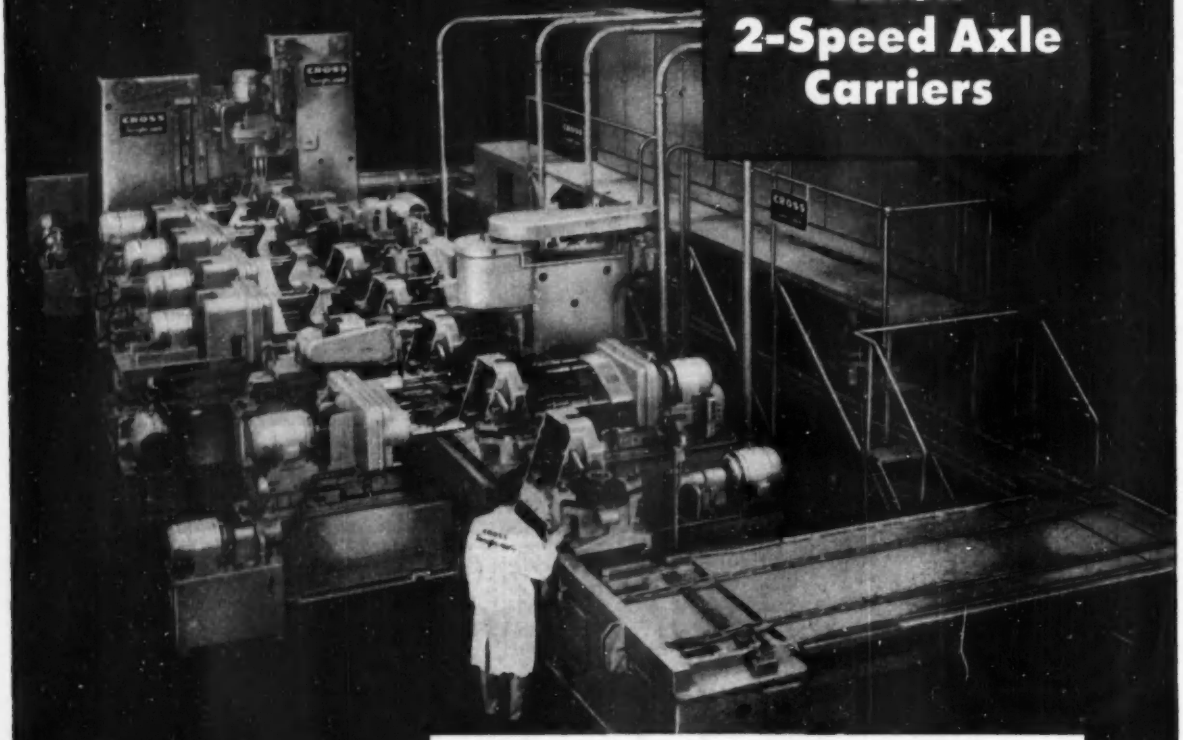
JONES & LAMSON

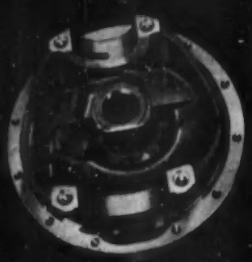
Machine Tool Craftsmen Since 1835

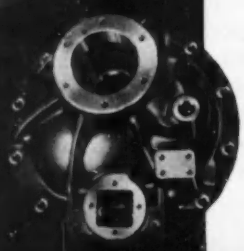
JONES & LAMSON MACHINE CO., 523 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.

Another Transfer-matic by Cross

Mills, Drills and Taps Eaton 2-Speed Axle Carriers







- ★ 53 parts per hour at 100% efficiency—capacity for spiral bevel or hypoid style carriers.
- ★ 97 operations: 60 drilling, chamfering and reaming; 5 milling; 4 spotfacing and counterboring; 28 tapping.
- ★ 9 stations: 1 loading, 1 unloading, 7 machining.
- ★ Two-position, progressive type work holding fixtures with automatic transfer from station to station and integral conveyor for automatic return from unloading to loading station.
- ★ Cleaning unit for removing chips from fixtures between unloading and loading station.
- ★ Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; individual lead screw feed for tapping; coolant system; automatic lubrication.

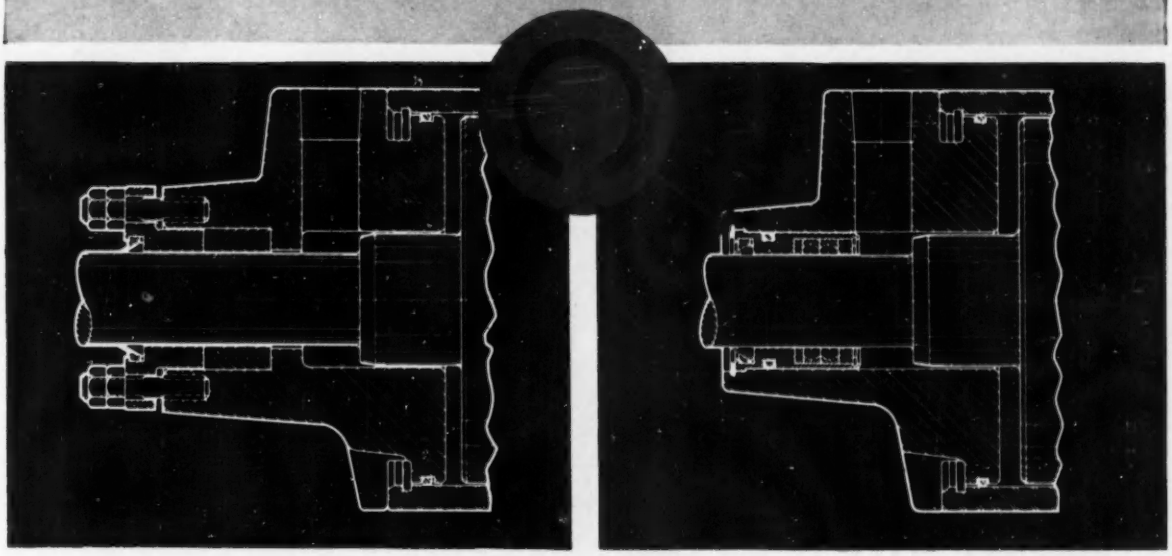
Established 1898

THE CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Waldes Truarc Ring Saves $2.84 Per Unit, Cuts Labor-Time and Materials in Hydraulic Packing Unit



OLD STYLE stuffing box required skilled worker to install packing rings one at a time, then adjust packing glands by trial and error. Disassembly was equally difficult, time-consuming and costly.

NEW Monopak Cartridge is smaller, lighter, streamlined and installed with one Truarc Retaining Ring. Disassembly and reassembly with new cartridge takes unskilled worker just 1 minute.

Hydraulic Accessories Company of Van Dyke, Michigan, uses a single Waldes Truarc Inverted Ring (internal series 5008) to hold Monopak Cartridge in cylinder head.

New design eliminates costly machining and saves 2⅛ lbs. of material. Re-design with Waldes Truarc Retaining Ring reduces stuffing box diameter from 3½" to 2⅞", and reduces length from 5⅞" to 4⅜". Allows savings in assembly, adjusting and testing.

NEW DESIGN USING WALDES TRUARC RING PERMITTED THESE SAVINGS PER UNIT

MACHINE TIME SAVED:	
Chucking, facing and boring	$ .72
Drilling and tapping 3 holes	.18
Drilling and counterboring 3 holes	.12
Assembling, adjusting, testing	.90
MATERIAL SAVED:	
1⅛ lbs. cast iron	.30
½ lb. bronze	.23
3 studs	.36
3 nuts	.03
TOTAL	$2.84

Waldes Truarc Retaining Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again. There's a Waldes Truarc Ring to answer every fastening problem.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Grooving Tool.

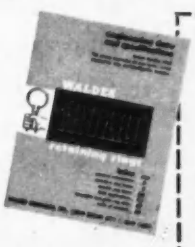
See the Waldes Truarc exhibit at the A.S.T.E. Show, April 26-30. Booth No. 424, Preclsion Hall.

SEND FOR NEW CATALOG

WALDES TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS



WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,362,947; 2,382,940; 2,416,092; 2,420,921; 2,420,341; 2,439,795; 2,441,846; 2,455,165; 2,493,560; 2,493,583; 2,497,802; 2,497,803; 2,691,306; 2,709,081 AND OTHER PATENTS PENDING

Waldes Kohinoor, Inc., 47-16 Austel Place, L.I.C. 1, N.Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print) A-Y-946

Name.....

Title.....

Company.....

Business Address.....

City..... Zone..... State.....

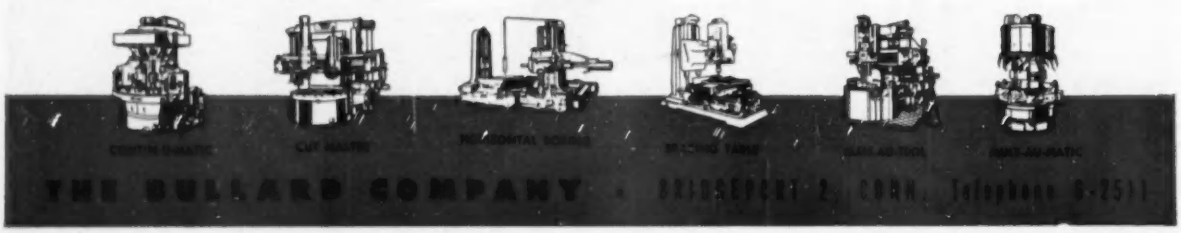
you have PRECISION at your finger-tips with a BULLARD SPACER

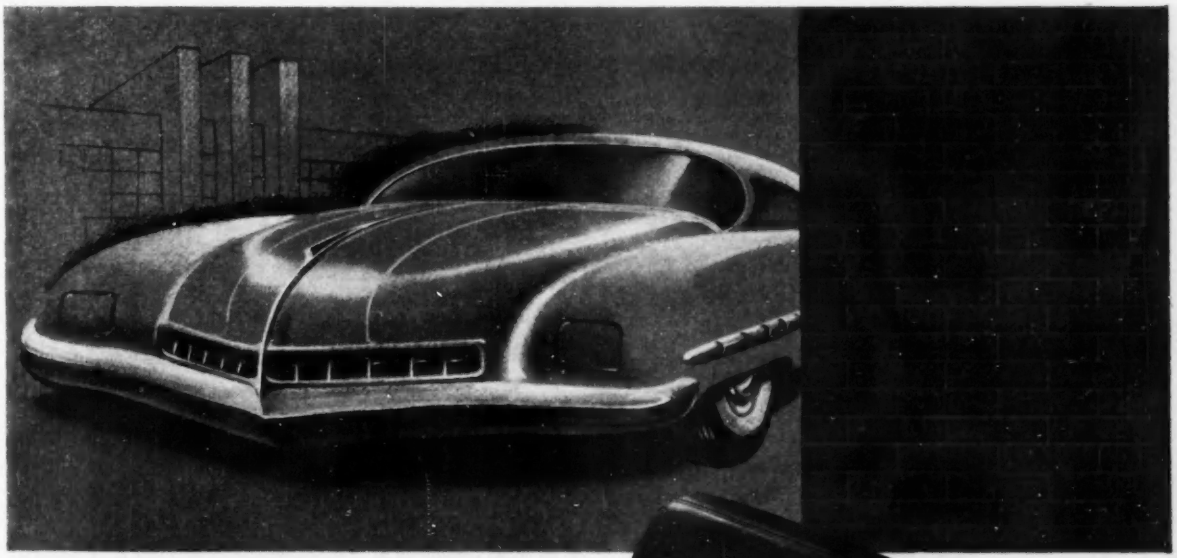
In plant after plant, in many diversified industries, The Bullard Spacer, day after day is convincing management and shop people alike, that where precision counts it is a "natural."

At the San Diego Division of Convair, a machine shop Superintendent says: "We have found the Bullard Spacer very useful in our work. The machine is simple to operate. It eliminates the necessity of zeroing to a set position and there is no chance for error, which is important when you make accurate parts for airplanes.

Accurate and precision drilling, reaming or tapping to exacting standards on difficult pieces without the high cost of jigs or fixtures, is maintained with a Bullard Spacer.

A call to your BULLARD Representative will convince you of the savings a Bullard Spacer will effect in your manufacturing methods, or write to...
The Bullard Company
Bridgeport 2, Connecticut





Maybe great sales-aids are just around the corner—

but the

Seats-of-the-future are here!

It's nice to look forward to future selling features—but it's much more *profitable* to have them right NOW.

That's why seats with the "custom" look and advanced design of that above are NOW appearing in so many cars of so many price ranges.

They're appearing all over because people—all over—want AIRFOAM, and plenty of it, in seats and backs and armrests, front AND rear.

They're appearing all over because people—all over – want the advanced styling made possible, at popular prices, by AIRFOAM design-engineering. Are you, too, offering people what they want TODAY?

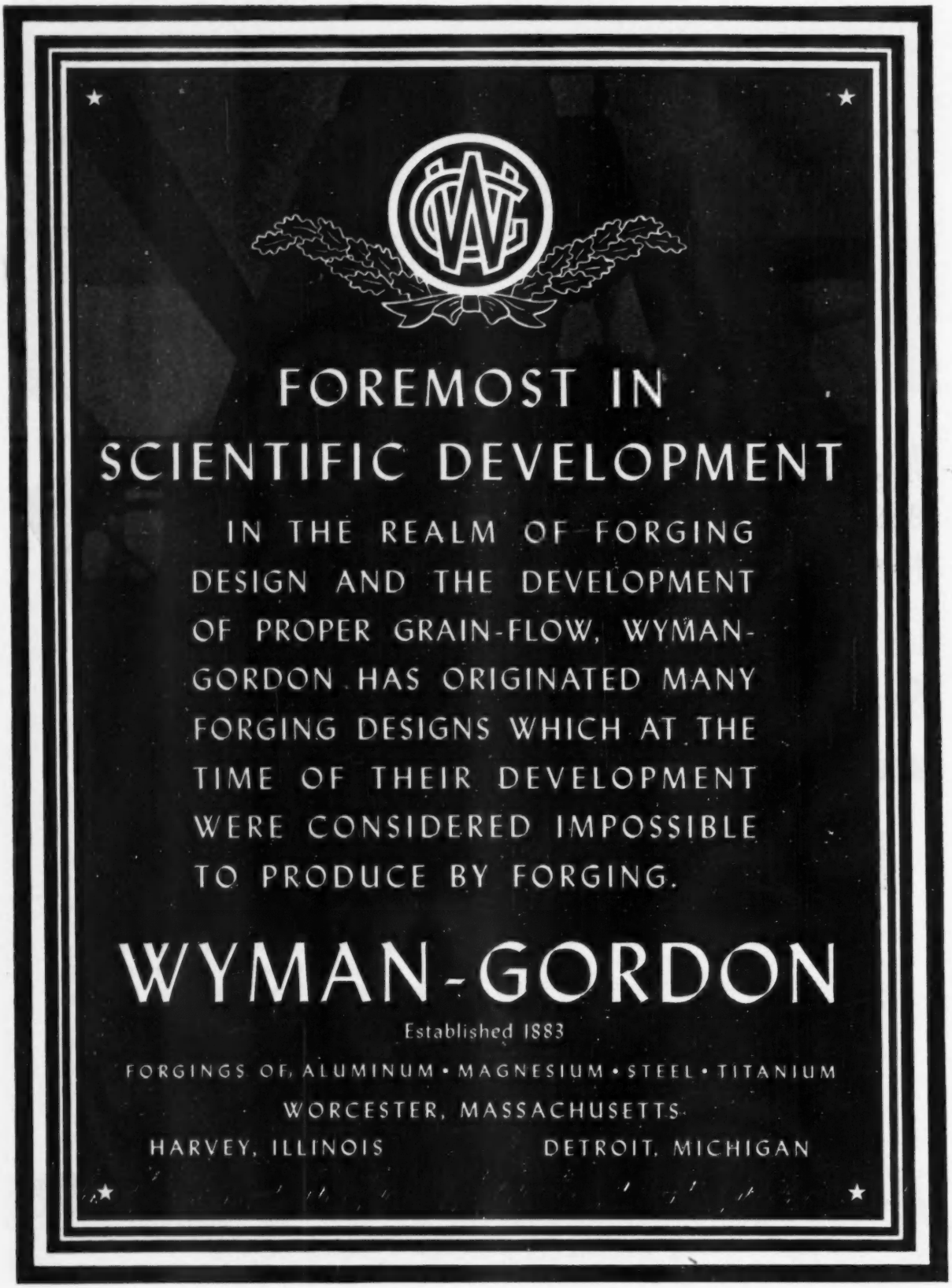
Goodyear. Automotive Products Department
O-6930, Akron 16, Ohio

Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Airfoam MADE ONLY BY **GOODYEAR**

THE WORLD'S FINEST CUSHIONING

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network


FOREMOST IN
SCIENTIFIC DEVELOPMENT
IN THE REALM OF FORGING DESIGN AND THE DEVELOPMENT OF PROPER GRAIN-FLOW, WYMAN-GORDON HAS ORIGINATED MANY FORGING DESIGNS WHICH AT THE TIME OF THEIR DEVELOPMENT WERE CONSIDERED IMPOSSIBLE TO PRODUCE BY FORGING.
WYMAN-GORDON
Established 1883
FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM
WORCESTER, MASSACHUSETTS
HARVEY, ILLINOIS
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You can design light weight, longer life, and economy into your products by including N-A-X HIGH-TENSILE in your plans.

It is 50% stronger than mild steel.
It is considerably more resistant to corrosion.
It has greater paint adhesion with less undercoat corrosion.
It has high fatigue life with great toughness.
It has greater resistance to abrasion or wear.
It is readily and easily welded by any process.
It polishes to a high lustre at minimum cost.

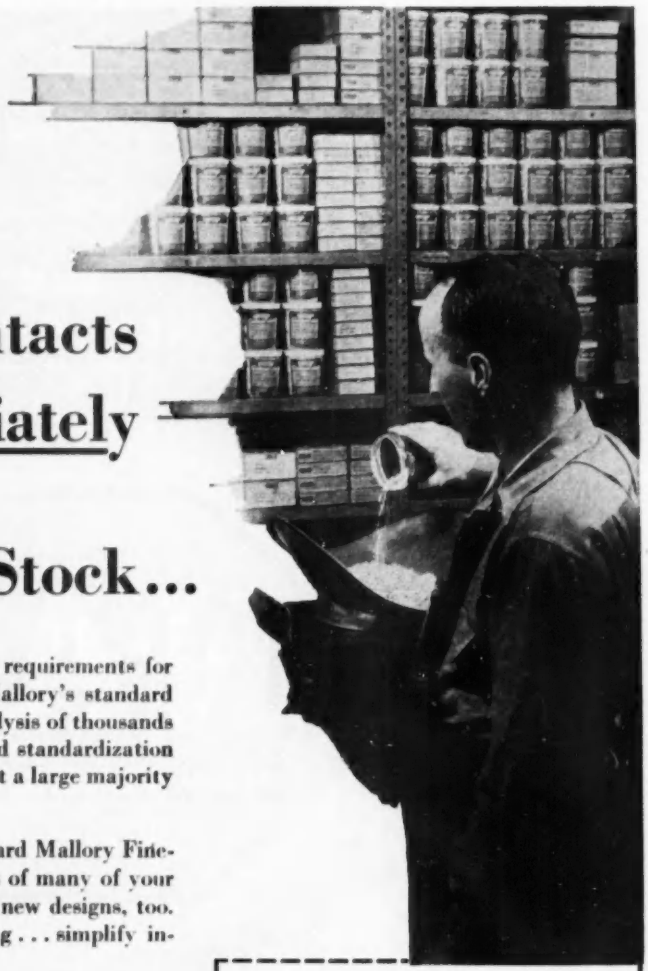
And with all these physical advantages over mild carbon steel—it can be cold formed as readily into the most difficult shaped stamping.

Sound like something for you? Ask for full facts and think of N-A-X HIGH-TENSILE when you re-design.

GREAT LAKES STEEL CORPORATION

N-A-X Alloy Division Ecorse, Detroit 29, Michigan

NATIONAL STEEL CORPORATION



Fine-Silver Contacts Shipped Immediately

From MALLORY Stock...

For the first time, you can order most of your requirements for fine-silver headed rivet contacts from stock! Mallory's standard stock program is the result of an engineering analysis of thousands of customer prints . . . an analysis that permitted standardization of 70 flat and radius-faced contacts that will meet a large majority of industry's requirements.

Check your present designs. You will find standard Mallory Fine-Silver Contacts that come within the tolerances of many of your requirements. Standardize the contacts in your new designs, too. It will save time in engineering and purchasing . . . simplify inventory problems.

The Mallory standard stock program offers:

- ***Prompt shipment, normally within 24 hours.***
- ***Immediate availability of samples when required.***
- ***Saving in time and cost of special designs and tooling.***
- ***Ready availability of small quantities for pilot runs and job orders.***

For complete prices, dimensions and part numbers of the 70 stock Mallory Contacts, write for your copy of Form 3-13 today. It provides a quick way to check against your present requirements and gives you all the data you need for new design work.

Some applications will always call for special contact designs. If yours is one of them, then call on the wide experience of Mallory engineers in designing specialized contacts. Modern facilities and a complete range of materials are available for economical production of contacts or contact assemblies to your special requirements.

Expect More... Get More from MALLORY

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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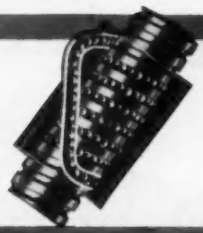
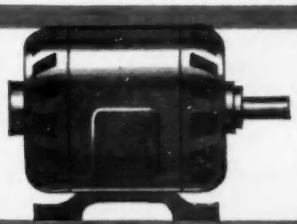
P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

To MOVE with less EFFORT

BALL-SCREW ACTUATORS



REDUCE THIS



TO THIS

If you could take about 80% of the friction out of your moving device, you could vastly reduce the size of motor needed.

Our ball-screw actuator is a combination of the screw (for power) and balls (for friction-free movement).

Many U. S. airplanes have installations of our ball-screw actuators. They have been used to help replace big motors with small ones; to improve control of motion; to eliminate human work required to crank something.

Besides saving weight and reducing the cost of friction—besides providing absolutely smooth motion—besides minimizing need for lubrication—the Ball-Screw Actuator permits the precision control of metal to metal. You can stop on a split micron!

We have expanded our capacity so that we can engineer industrial applications now. Write for booklet describing actuators and their uses.

CLEVELAND PNEUMATIC
TOOL COMPANY
DEPT. G-4 • CLEVELAND 5, OHIO

BALL-SCREW ACTUATORS AIR-OIL SHOCK ABSORBERS

To CUSHION SHOCK...

CPT's shock absorber principle combines pneumatic and hydraulic cushioning. It can control minute vibrations or tons of impact. It is the shock absorber for the largest aircraft landing gear (CPT is world's biggest manufacturer of landing gears), but the principle can be adapted to finger-sized units. May we discuss with you how to draw the shock out of stopping or take the motion out of vibration?

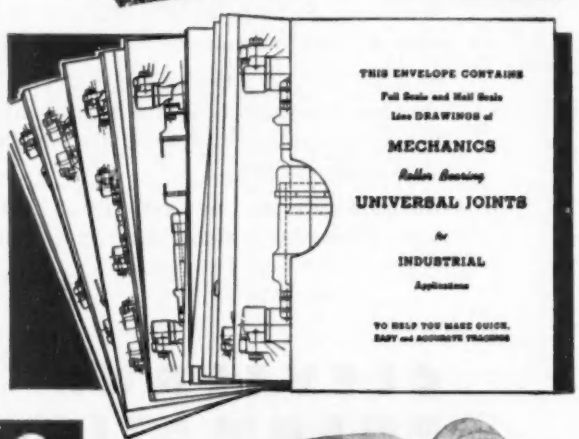
WORLD'S LARGEST MANUFACTURER OF AIRCRAFT LANDING GEARS

Let Us Help Design SALES Advantages Into YOUR Product

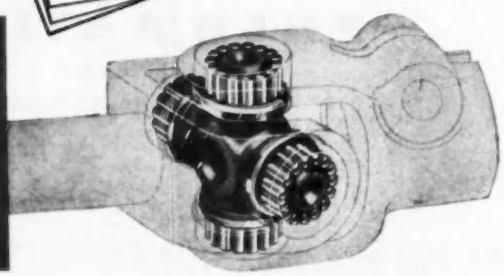
AS sales competition increases, it will pay you to find out how a MECHANICS field engineer can help you. He is backed by a large department of engineers who gained their extensive experience through research and analysis covering thousands of universal joint applications. When they concentrate on a joint problem, they are bound to come up with cost cutting, weight reducing, space saving, assembly speeding, down-time shortening and other sales making suggestions. Seldom is a joint problem peculiar to any one company. Other manufacturers have been up against it — and MECHANICS helped solve it. If your company has a joint problem, why not use 16 approaches to its solution? A phone call or a letter will bring you help from the MECHANICS engineering department. Or, send for the free engineering kit, shown at the right.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Avenue, Rockford, Illinois

GET THIS HANDY UNIVERSAL JOINT ENGINEERING KIT



MECHANICS
Roller Bearing BW
UNIVERSAL JOINTS
For Cars • Trucks • Tractors • Farm Implements • Road Machinery • Aircraft • Tanks • Busses and Industrial Equipment



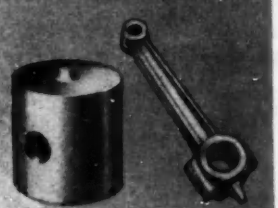
These are parts of the casing for a new underwater guided missile, sand cast in the foundries of Aluminum Industries, Inc.

This big sand casting is a part for bakery equipment that will eventually find its way into a GI kitchen.

Aluminum sand casting, light-weight yet strong, is ideal for this Supercharger housing. This is for a conventional propeller aircraft.

This main housing is one of seven parts of a fuel pump sand cast by Aluminum Industries, Inc. for aircraft application.

Washing machine agitators, cast by the permanent mold process, are a peacetime product of the Aluminum Industries, Inc. foundries.



Pistons of all types are cast by Aluminum Industries, Inc. This small piston and the connecting rod are permanent mold castings for small utility engines.

Compressor casing for jet aircraft engine. Exceptionally large permanent mold castings, weight 130 lbs. each. Aluminum Industries, Inc. casts numerous parts for the J-47.

weapons... washers... and wheels

A little part of the big story of

Aluminum Castings

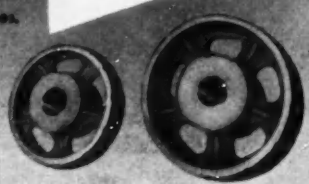
produced in

ALUMINUM INDUSTRIES

Foundries

● Manufacturers in many different lines of civilian and defense production often are able to speed output or reduce costs, or both, by changing to lightweight aluminum castings by Aluminum Industries, Inc. Our engineers will gladly consult with you and make recommendations on your parts requirements.

ALUMINUM INDUSTRIES, Inc.
CINCINNATI 25, OHIO
New York: 9 Rockefeller Plaza
Detroit: 809 New Center Bldg.
Chicago: 64 E. Jackson Blvd.



The diversity of castings produced in Aluminum Industries, Inc. foundries is endless. These aluminum sand castings are caster wheels for industrial trucks.

PERMITE Aluminum Castings

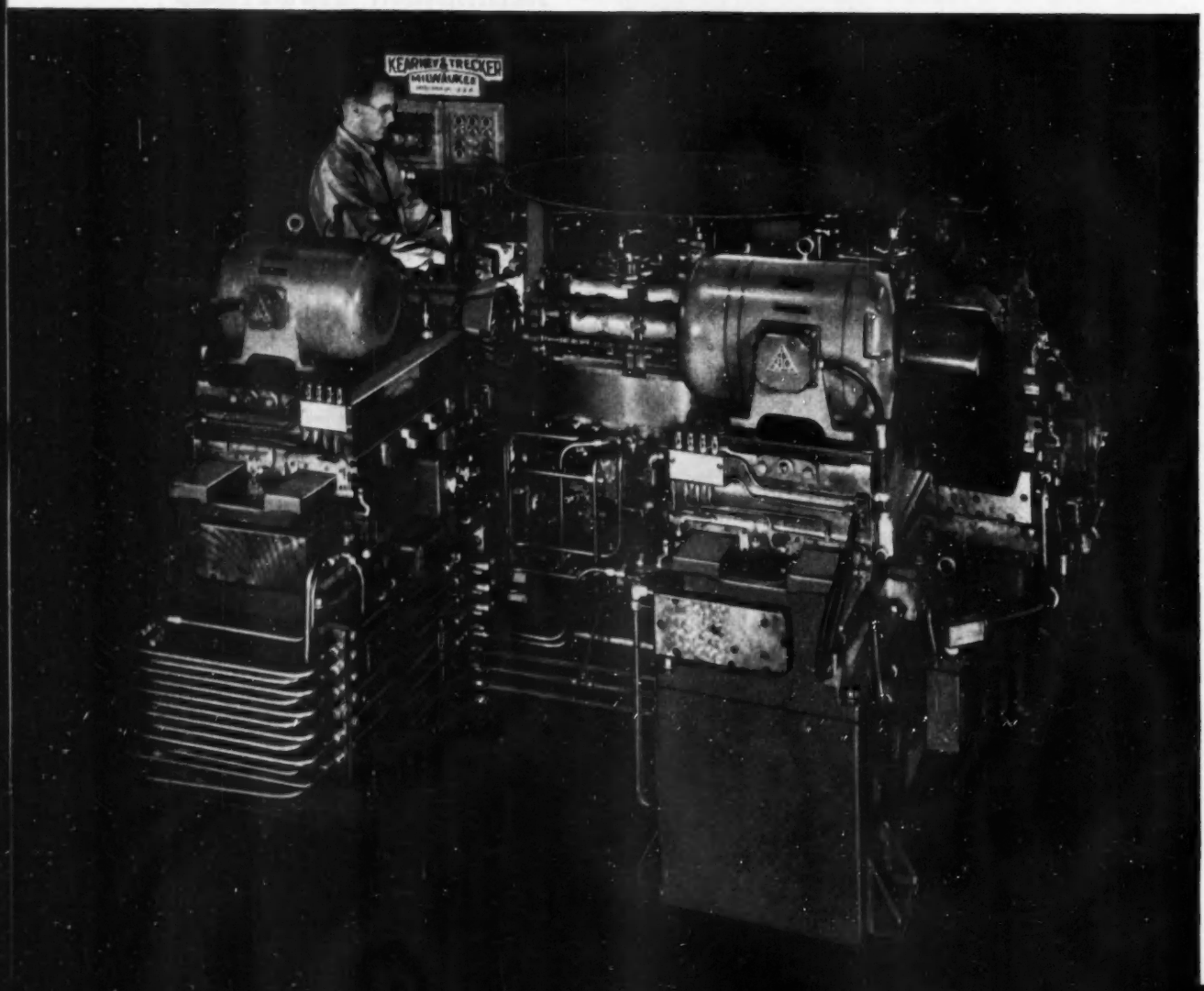
ALUMINUM PERMANENT MOLD and SAND CASTINGS... HARDENED, GROUND and FORGED STEEL PARTS

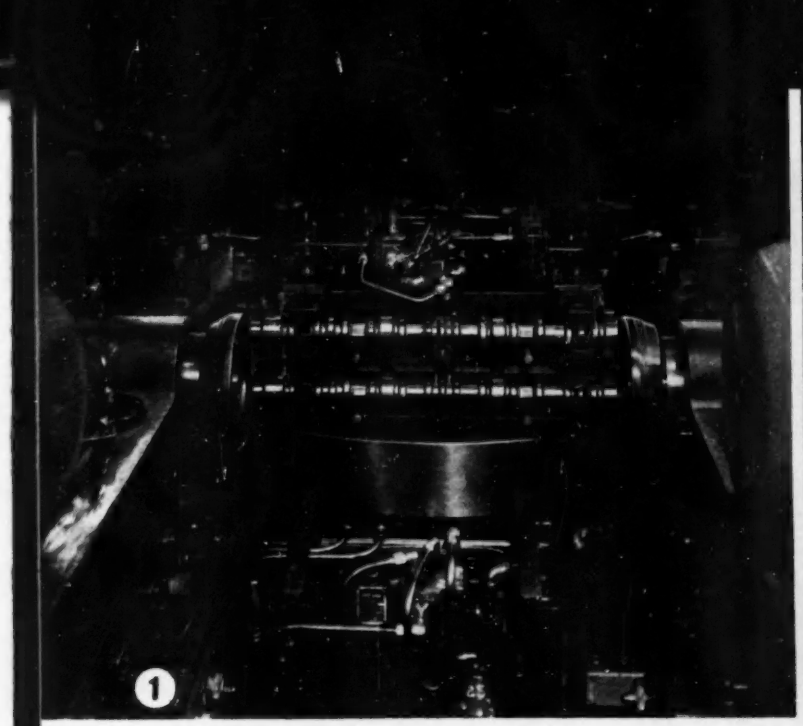
PRODUCTION MACHINING REPORT:

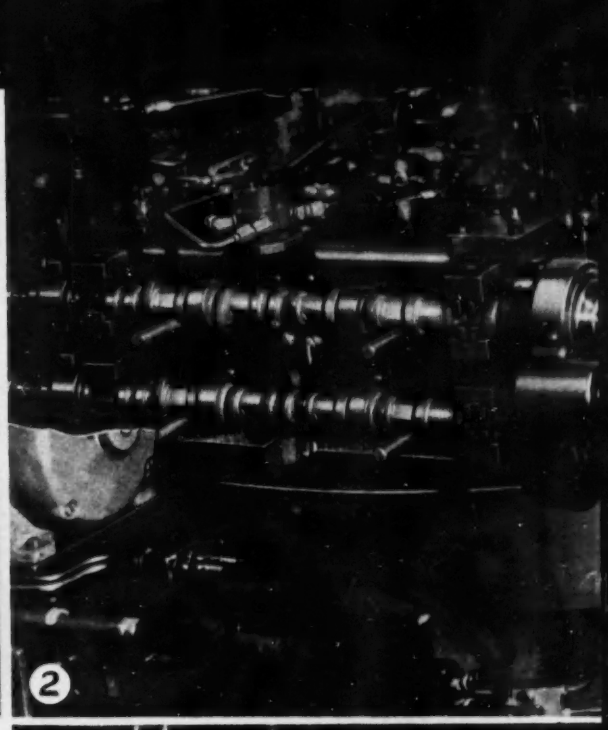
New production machine mills and drills 288 camshafts hourly

THREE of these high production, four-station rotary indexing machines were recently installed by one of the world's largest automotive manufacturers. A particularly interesting aspect of the machines — which were designed and built by Kearney & Trecker — is the fact that standard units were utilized wherever possible. This not only moved up the delivery date, but also resulted in a dramatic saving in cost. See photos 1, 2 and 3 for the sequence of operations which results in production of 288 cast iron camshafts per hour per machine.

Basically, the machine is comprised of a 60" rotary indexing table and base . . . two milling units, each with one spindle . . . one drilling unit with two spindles . . . and a second drilling unit with four spindles.

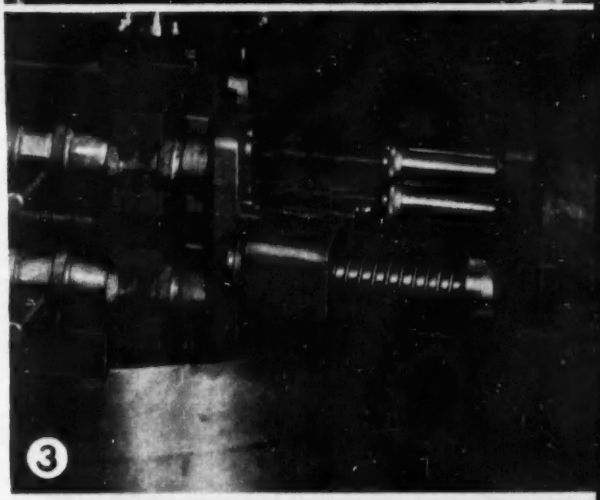






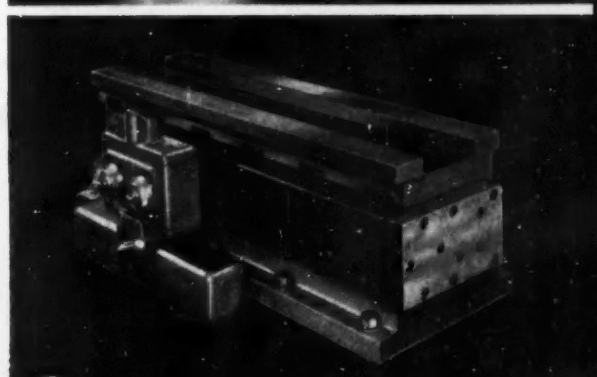
1. After 2 workpieces have been manually loaded, table indexes automatically to station 2, where both ends are milled to length. Each milling unit has a 10" dia. face mill with 36 T.C. inserted blades. Left hand head is powered by a 7½ hp motor. Right hand head by a 10 hp motor.

2. Table automatically indexes to drilling station and camshafts are center-drilled on each end. Drilling units are powered by a 1 hp motor. (Motor partially cut away to show drilling). Each of 4 hydraulic clamping and equalizing fixtures holds 2 workpieces. Location of workpiece is taken from end body diameters with end location from the center bearing.



3. At the final station there is a 2 hp drilling head which carries 4 spindles. Two drive holes are drilled in one end of each camshaft. Spindles operate at fixed speeds.

4. Here are two of the components which make major contributions to the machine's performance at reasonable cost. TOP: This is the feed slide unit. It is available in four standard sizes. All sizes feature a hydraulic control panel which can be mounted at either side... hardened and ground ways... a massive one-piece base casting which absorbs vibration. BOTTOM: This 60" rotary indexing table is one of four standard sizes available. Each table can be arranged for any practical number of indexes or for continuous rotary feed.



For more comprehensive facts on this machine and its standard units, write for Data Sheets No. 1018, No. 1019 and No. 1020. For details on the facilities and engineering services offered by our recently expanded Special Machinery Division, see your representative or write for booklet, "Doorway to a proven method for solving big or small metalworking problems." Kearney & Trecker Corp., 6784 West National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

KEARNEY & TRECKER
CORPORATION
Special Machinery Division
MILWAUKEE 14, WIS., U. S. A.

For BIG TOUGH JOBS...

CATERPILLAR . . .

AND THE **POTTER & JOHNSTON**

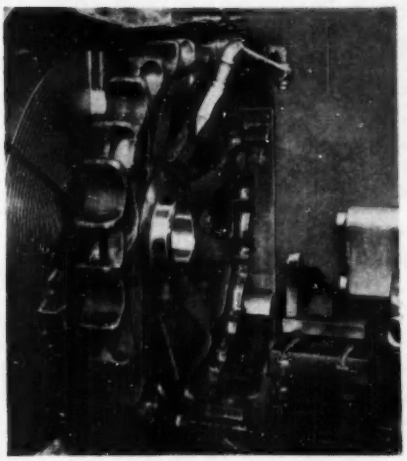
10-U AUTOMATIC *Turret Lathe*

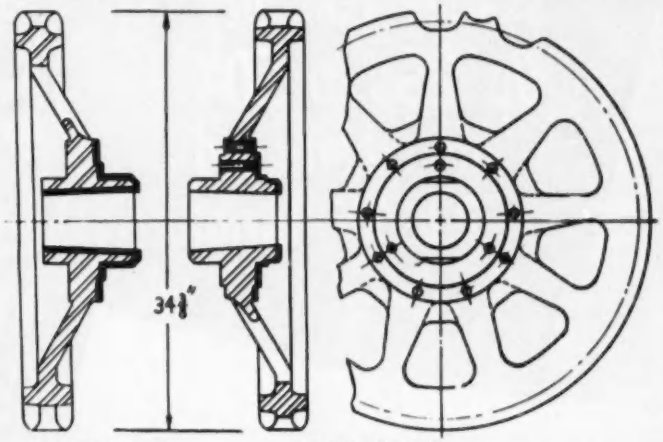
Famous as GIANT PRODUCERS that STAY ON THE JOB

they OUTWORK all the rest

For big tough turning work that must be handled economically, it was logical that Caterpillar Tractor Co. of Peoria, Illinois looked to Potter & Johnston for the most versatile machine and method to do the job. In this case, it was to machine sprockets — 34⅜" diameter cast steel track drivers with a maximum hub hardness of Shore 45.

HERE ARE THE RESULTS !!





FIRST OPERATION SECOND OPERATION

HEAVY LINES INDICATE MACHINED SURFACES

FLOOR-TO-FLOOR TIME: 21.82 minutes per piece for complete finishing.

FIRST OPERATION: Turn taper bore with single point slide tool, turn face and chamfer inside sprocket hub.

SECOND OPERATION: Turn face and chamfer the outside hub. Drill nine .316" diameter holes equally spaced, and drill three, 23/64" diameter holes reamed to a tolerance of .001".

It takes full power, real productive capacity, and stamina to machine these track sprockets with high precision and low production costs, day-in and day-out. In this job, extra benefits from ingenious P & J Tooling were realized. As part of the second fully automatic operation, all twelve holes were drilled by using a self-driven Multiple Spindle Drill Head.

To turn out your hard-to-machine work faster and better — turn to the Potter & Johnston line of Automatic Turret Lathes — five basic machines feature fully automatic operation — from the 3-U Speed-Flex with a 9½" diameter swing over the cross slides to the Model 10-U AUTOMATIC with its 49" diameter swing over the base ways. For Model 10-U information ask for Bulletin No. 146 . . . for information on other models, call your nearest Pratt & Whitney Branch Office. An experienced P & J Tooling Engineer will study your piece drawings and furnish an accurate written estimate of expected piece production, plus a recommendation for the best combination of tooling and operational sequence. There is no obligation for this technical service.

MODERNIZE with POTTER & JOHNSTON REPLACE FOR PROFIT

POTTER & JOHNSTON Co.

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF

PRATT & WHITNEY

DIVISION NILES – BEMENT – POND COMPANY

New SKF Bulletin Shows you how to get Spherical Roller Bearing capacity Up 25% to 50% life increased 2 to 3½ times...

Here, in a handy 12-page SKF Bulletin, is the information you need to take advantage of an SKF design improvement which

1. **Increases spherical roller bearing capacity 25% to 50%.**
2. **Increases service life 2 to 3½ times.**
3. **Carries heavier combined radial and thrust loads, or pure thrust loads of greater magnitude.**
4. **Is fully self-aligning.**

SKF *originated* the spherical roller bearing; now, again, the same pioneering kind of engineering provides industry with another important anti-friction first. This latest advance has been thoroughly proved over an extensive period in such applications as railroad journals, vibrating screens, steel mill machinery and other hard-service locations.

Send for your free copy of Bulletin No. 365-6 which gives complete facts—sizes available—increased life you can expect for each size. And remember that a Sales Engineer in any SKF District Office can and will help you make the best use of it.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
—manufacturers of **SKF** *and* **HESS-BRIGHT** *bearings.*

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SKF®
BALL AND ROLLER BEARINGS

ANOTHER *American* FIRST ✻

STRADDLE BROACHING ON ROTARY MACHINE MEETS HIGH-SPEED PRODUCTION DEMANDS

1000 connecting rod caps broached per hour —

Continuous, automatic broaching is a necessity on some high production jobs. When required and the nature of the work permits, American engineers develop special, revolutionary machines to solve bottlenecks and reduce metal removal costs to the lowest possible point.

A typical example is this special 36" Rotary Continuous Surface Broaching Machine. It is designed to straddle broach two sides of a connecting rod cap. The production cycle is continuous. The operator manually loads parts into the holding fixture. As the part moves into broaching position it is automatically clamped, broached, unclamped, and ejected into the chute at the bottom of the machine. Operating at 75% efficiency, this American machine is capable of producing 1000 parts per hour. The connecting rod cap is a steel forging.

For practical, high production, low cost solutions to your metal cutting problems see American first. A sample part or detail drawing and mention of your production requirements will receive prompt attention from American.

Write today for American Circular 300 which gives you data on standard American Vertical Hydraulic Surface Broaching Machines.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
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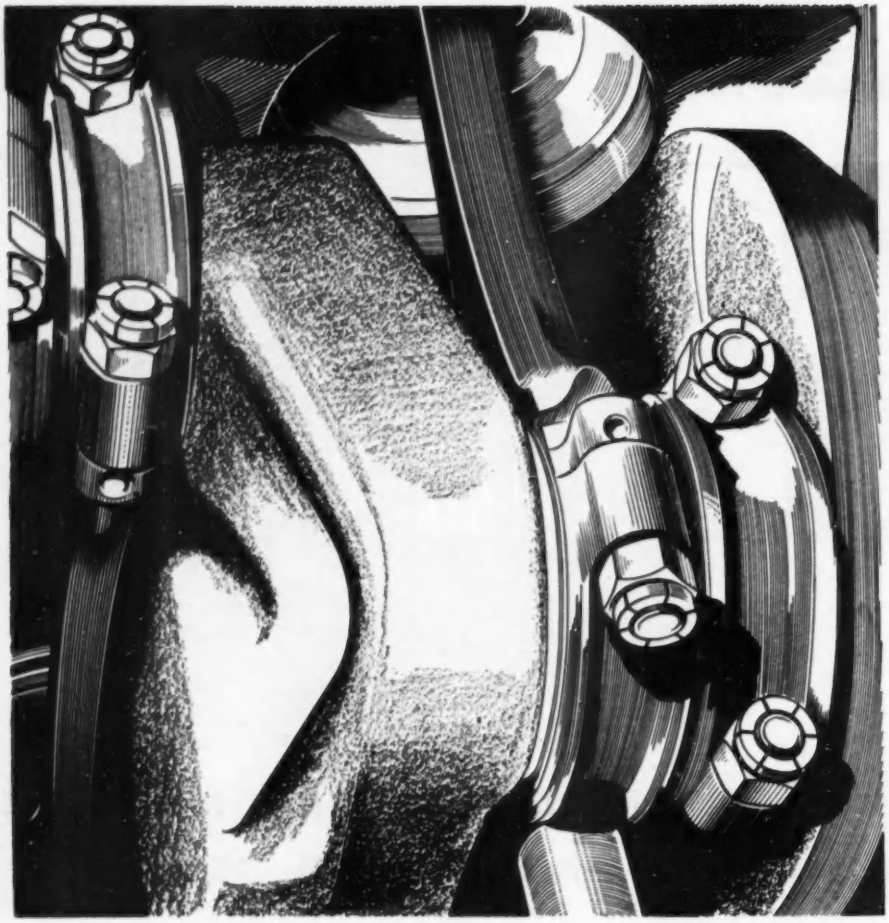
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



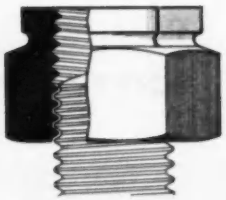
More and more automotive repair shops and industrial plants are turning to FLEXLOCs to reduce maintenance on high speed, vibrating equipment.

FLEXLOC locknuts save $600 per year in reconditioning automobile engines

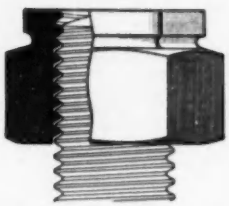
By using FLEXLOCs on connecting rod bolts, a motor reconditioning shop cut assembly time by a minimum of 5 minutes per motor. This added up to a yearly saving of 250 hours or $600. No drilling of bolts was needed . . . no adjusting of nuts to set cotter pins was required. And the FLEXLOCs assured a tighter assembly than was possible with the castellated nuts and cotter pins formerly used.

FLEXLOC locknuts reduce maintenance too. Once they are installed, you can forget them. Service and inspection periods can be stretched safely from days to weeks. And FLEXLOCs are reusable. They can be applied again and again without losing locking efficiency.

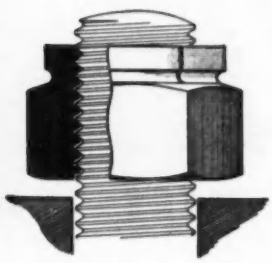
You can get FLEXLOC Self-Locking Nuts of various types and materials in a wide range of sizes and in any quantity. These one-piece, all-metal nuts are carried in stock by leading industrial distributors everywhere. Write for literature and samples for test purposes. STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.



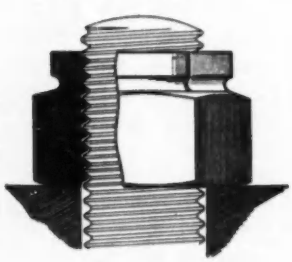
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not loosen a FLEXLOC, yet there is no galling of threads.

FLEXLOC® LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

NEW Viscasil

HIGH-VISCOSITY SILICONE FLUIDS

FOR NEW IDEAS IN PRODUCT DESIGN

Rate-measuring gyroscope, type K, courtesy Doelcam Corporation

Torsional vibration damper, courtesy Houdaille-Hershey Corporation

IDEAL FOR DAMPING!

Their flat viscosity-temperature curve, stability at elevated temperatures, nearly Newtonian viscosity characteristics and ability to resist breakdown under continual high-shearing stresses make G-E Viscasil fluids ideal for all kinds of viscous dampers.

EVALUATE G-E VISCASIL FLUIDS NOW!

Now is the time to begin *your* evaluations of these new fluids. They are destined to revolutionize many current design concepts. Through them *you* may achieve simplified designs, increased product reliability and performance—even *new* products never possible before. As you "imagineer" with them, remember to free your thinking from the design limitations imposed by conventional materials. *G-E Viscasil fluids often dictate the design!*

G-E silicones fit in your future

GENERAL ELECTRIC

General Electric's new Viscasil fluids offer tremendous potential for *new* product design and *present* product improvement because of this unusual combination of properties:

- **Relatively small change in viscosity over a wide temperature range**
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- **Outstanding resistance to shear breakdown**
- **Unusual chemical inertness and stability**
- **Compressibility — far greater than other fluids**

Available in viscosities from 1,000 to 100,000 or more centistokes, these versatile silicone fluids are ideal for such applications as:

Torsional vibration dampers
Dashpot dampers **Shock absorbers**
Fluid couplings **Servo mechanisms**
Electrical, release, pharmaceutical and cosmetic applications

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Please send me product data on G-E Viscasil fluids. I want this for ( ) Reference purposes only ( ) An immediate application on_____

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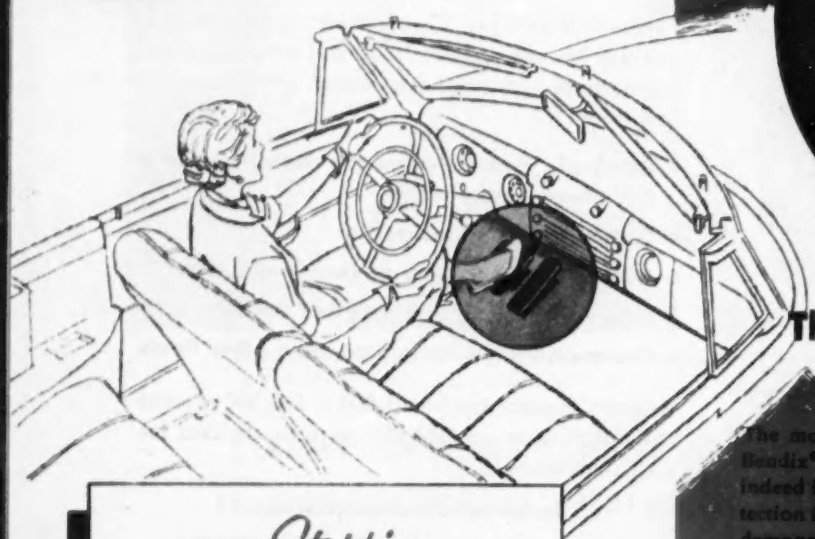
IN CANADA: Mail to Canadian General Electric Company, Ltd., Toronto

STOPS with BENDIX Low Pedal Power Brakes STARTS you with a big Sales Advantage



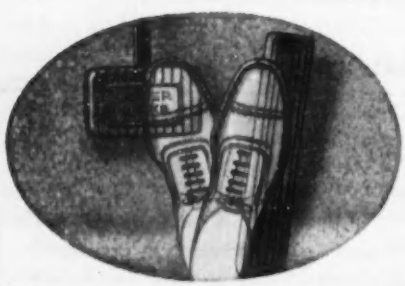
The Only Performance Proven Low Pedal Power Brake!

The moment a prospect steps into a car equipped with a Bendix® Low Pedal Power Brake, he recognizes that here indeed is a new car feature that will provide maximum protection from today's driving hazards. After even the shortest demonstration drive, the effortless, quick and powerful action of the Bendix Low Pedal Power Brake proves to be a new and thrilling experience in motor car control.

That's why STOPS with Bendix Low Pedal Power Brakes—STARTS you with a big sales advantage.

This greatest improvement in braking since four-wheel brakes is unique in many ways. It is, for example, the only LOW PEDAL power brake that has met the test of millions of miles under all operating conditions! In fact, Bendix Low Pedal Power Brake is specified by more manufacturers than any other make. Remember, too, this new low pedal power brake is the product of Bendix—world's largest producer of power brakes and leader in braking development since the earliest days of the industry.

NOW *Stopping* IS AS EASY AS *accelerating*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

Result! **MORE DRIVING COMFORT, LESS FATIGUE AND GREATER SAFETY**

Bendix Products Division

BENDIX PRODUCTS DIVISION SOUTH BEND

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High Spots of This Issue

★ **Twin Hydra-Matic Has Multiplicity of Gear Ratios**

GMC Truck & Coach Div. of General Motors has fulfilled a need of long standing with the announcement of an automatic drive for heavy-duty trucks with enough gear ratios to meet all requirements. Its design features are described here. Page 50.

★ **Unique Conveyor System for Instrument Assembly**

The new AC Spark Plug plant at Flint, Mich., produces quite a number of vehicle instruments, including the Buick speedometer. Indispensable keystone of the assembly lines is a conveyor for parts and subassemblies, as well as storage. Page 52.

★ **Latest Tooling for Making Mercury Engine Cylinder Heads**

This article marks the launching of a series dealing with machining operations on components of the new Mercury 161-hp, V-8 engine. Covered in the first survey are processes in the manufacture of heads at the Ford Cleveland plant. Page 56.

★ **Trouble Shooting by Parts Makers Aids Industry**

Four major companies and their vital research work are treated in this third of a series of articles on the parts industries. The author draws particular attention to the complete facilities devoted to these worthy efforts. See Page 64.

★ **Foreign Barriers to U. S. Motor Vehicle Exports**

Shipments of American vehicles abroad have undergone an appreciable decline in the last few years. The export loss has been in direct proportion to tightening import restrictions overseas. These barriers and their causes are analyzed. Page 68.

★ **26 New Product Items**
And Other High Spots, Such As:

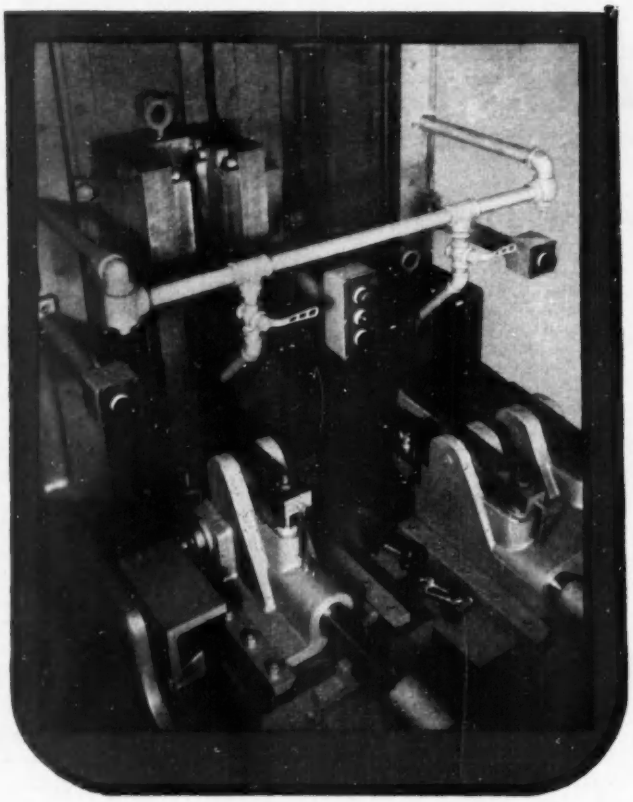
Big need for tractors in France; timely problems discussed at SAE meeting; 50 years of track type tractors; air-actuated transmission has automatic brake band adjustment; new standards for truck mufflers; Monroe linkage type power steering; Studebaker offers V-8 engine in 1954 trucks; and new Fruehauf aluminum trailer.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

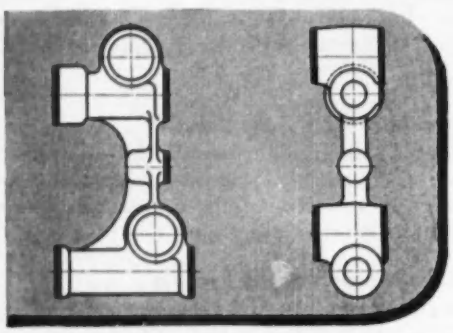
NINE SURFACES

HYDRO-BROACHED IN TWO OPERATIONS



Below: Drawing of part broached on the CINCINNATI equipment illustrated here. Heavy lines indicate broached surfaces.

Part name	Valve rocker bracket
Material	Cast iron
Operation	Broach all bosses
Broaching speed	35 feet per minute
Production	280 parts per hour
Equipment	CINCINNATI No. 5-42 Duplex Vertical Hydro-Broach, completely equipped



There's usually a way to save man-hours and floor space while increasing or retaining the production of many machining operations. The equipment illustrated here shows one way to do it.

In two progressive operations *nine* surfaces of valve rocker brackets are broached each cycle of the machine, at a production rate of 280 parts per hour.

For this job, Cincinnati Application Engineers tooled up a new No. 5-42 Duplex Vertical Hydro-Broach with suitable broach holders, inserts (cutters), and two automatic fixtures to accommodate three sizes of parts. In progressing from the left- to the right-hand fixture, all nine surfaces are quickly and accurately broached. ¶Does this equipment and method give you an idea which you would like to apply in your own shop? Our Application Engineers will help you work out the details. But if you're not familiar with the new CINCINNATI Duplex Vertical Hydro-Broach Machines, we suggest that you write for literature. You'll find that it's well worth waiting for these new machines.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 110, No. 7 **April 1, 1954**

Curbs Force GM, Ford To Shut India Plants

Nearly half of the major foreign automobile companies in India are expected to close soon as a result of the country's attempt to create a domestic car-making industry. American-owned General Motors Corp. already has shut down, and Ford is expected to close soon.

GM and Ford were India's largest automobile firms, and both operated plants in Bombay. Ford, which two months ago sold its spare parts inventory to a Madras company, is expected to dispose of its holdings to the same firm. The Indian company earlier bought up GM's parts inventory.

Ford and GM point out that it is uneconomic to manufacture cars in India because of the high customs duties. Chrysler and Studebaker subsidiaries, however, which are Indian-owned, will remain in the country's car producing picture.

NEMESIS OF SUBMARINES

The Navy's latest sub-killer, the Lockheed P2V-7, has double-bubble pilot canopy for increased visibility, jet pod engines supplementing its giant turbo-compound powerplants and elongated tail housing electronic sub-hunting equipment. It can be converted for patrol, mine-laying, or torpedo bomber duty.

Packard Net Down In Fourth Quarter

Although net earnings of Packard Motor Car Co. during the first nine months of 1953 went up to $6 million, an indicated fourth quarter loss of $597,233 brought the total earnings for the year down to $5.44 million. The total compares with $5.61 million earned in 1952. Sales for the year jumped 43.6 per cent to $335.81 million.

The company attributed its increase in sales volume to its new program of reorganization and the establishing of a market in the luxury and medium-price fields. Packard dealers, the company said, were able to keep their inventories in balance with the market.

Last year, the company started its basic internal modernization program. This includes a new $2 million styling research laboratory, modernization of methods, revamping of its management staff, and expansion of its manufacturing and engineering facilities.

Studebaker Net Drops; Sales Climb Slightly

Although net sales of Studebaker Corporation during 1953 rose from $585.3 million in the previous year to $594.2 million, net profit dropped sharply from $14.2 to $2.6 million.

In its annual report to stockholders, the company noted that inventories at the end of 1953 increased by $8.6 million to $72.5 million. The company blamed the drop in business in 1953 on tooling problems, a supplier's strike which it said caused a "serious" cutback in production, and price-cutting by other car makers.

Nash Announces Prices On New Metropolitan

Prices have been announced on the recently unveiled Nash Metropolitan line. (See AUTOMOTIVE INDUSTRIES, March 15, p. 78.) The hardtop model is listed at $1445, while the soft top or convertible model is $1469. Both prices are f.o.b. costal ports of entry.

Chevrolet Pays $1 Million For Employee Suggestions

Chevrolet Motor Div. reports it has paid out $1 million to employees under its Suggestion Award Plan. It is the first automotive division of GM to reach that total.

The plan was started in 1942 for hourly rated employees. Maximum award is $2500 for ideas on improving production methods or savings.

News of the AUTOMOTIVE

GM Sales in 1953 Soared to $10 Billion Peak; Net Earnings in Third Place

Although sales of General Motors Corp. skyrocketed to a record $10 billion in 1953, net income was only the third highest in the company's history. Earnings last year amounted to $598 million, representing a return of six per cent on sales, compared with net earnings of $559 million, or 7.4 per cent of sales in 1952.

Tax Bites

While Federal and foreign income taxes paid out by General Motors in 1953 were lower than the previous year, total taxes of the company mounted to $1.237 billion. The corporation's excess profits taxes last year went up to $192 million from $158 million in 1952. U. S. and foreign taxes amounted to $863 million.

Sales and excise taxes collected by GM on its products totaled $661 million to bring ascertainable taxes for the year to $1.898 billion. This was more than five times the amount paid in dividends on common stock.

Share of Market Up

While GM's market penetration fell short of its pre-war share, its performance was much better than in 1951 and 1952. Last year, the company obtained 45.7 per cent of the industry's U. S. and Canadian factory sales of cars and 40.2 per cent of all trucks. GM achieved its record industry share in 1941, when it obtained 48.1 per cent of the car market and 41.1 per cent of the truck market.

Civilian products accounted for about 81 per cent of the company's total sales in 1953. The other 19 per cent were from defense products.

During the year, GM divisions turned out a total of 3,495,999 vehicles, compared with 2,434,160 in 1952 and 3,016,486 in 1951. Sales of car and truck units from U. S. plants during the year totaled 3,276,586, representing an increase of 47 per cent over 1952.

Foreign, Local Investments

GM points out that its net income in 1953 was increased by about $15 million by the inclusion of General Motors-Holden, Ltd., profits earned by the Australia operations from 1940 through 1952, which had previously been deferred because of exchange restrictions. In 1952, GM's net income was increased by the inclusion of about $30 million of profits reinvested in Canada that had been earned from 1940 through 1950.

The firm spent $502 million in 1953 for real estate, plants, and equipment, excluding special tools. About 35 per cent of this outlay came from provisions for depreciation. The remainder was provided for largely from earnings reinvested in the business. The company notes that between 1950 and 1953 such expenditures amounted to $1.280 billion.

Employment Situation

General Motors reports that employment and payrolls climbed to a record high in 1953. Average employment in U. S. plants during the year was 551,095, compared with 458,680 a year earlier. Payrolls went up from about $2 billion to more than $2.6 billion.

The average of 385,929 hourly rated workers was 77,474 higher than the 308,455 in 1952. The payroll, exceeding $1.85 billion to hourly employes, was $484.5 million higher than in 1952, with such employes working an average of 41.9 hours in 1953 and earning an average of $92.27 weekly. The longer hours and higher pay were attributed to overtime work during the first six months.

During the year the company paid out $30 million in various kinds of group insurance, and there were 11,281 former hourly and salaried employes receiving retirement benefits.

COMBINED TRAILERS HAUL CARS

This prototype transport for cars was built in South Africa by L. H. L. Engineering Co. (Pty.), Ltd., with a Leyland Comet 90 tractor. The 29-ft semi-trailer holds two cars on ramps and a third underneath. The 26-ft two-wheeled trailer can carry two smaller cars.

AND AVIATION INDUSTRIES

Chrysler Charges Union Intimidates Foremen

Outcome of a suit filed by Chrysler Corp. against the UAW-CIO has considerable significance for the rest of the automobile industry. The company has asked for a court injunction to restrain Dodge Truck Local No. 140 (UAW-CIO) from intimidating foremen at the plant.

The bill of complaint alleges that the union local has caused irreparable damage to two Dodge Truck employees and impaired the company's right to manage facilities. Chrysler charged that the two men were brought to "trial" by the union after the company transferred them from their jobs as foremen to hourly work. The transfers reportedly were necessary because of cutbacks in defense production.

Although the foremen were not members of the union, a union trial committee charged them with "conduct unbecoming a member of the union," the Chrysler complaint alleges; they were then fined $100 and $70 by the union. In its complaint, the company also states that the union has tried other employees and that it is subjecting present foremen to threats of reprisal "if the foremen properly perform their managerial duties."

Metal Powder Show Program This Month Is Announced

Details have been announced regarding the 1954 Metal Powder Show and tenth annual meeting of the Metal Powder Association. Both events will be held April 26 to 28 at the Drake Hotel in Chicago.

Technical sessions at the meeting will be divided into a General Session devoted to papers relating to a variety of aspects of powder metallurgy, and (2) an Electronic Core Session devoted to subjects of specific interest to those in this specialized field. One of the featured speakers at the first session will be Joseph Geschelin, Detroit editor of AUTOMOTIVE INDUSTRIES, who will present a paper on "Powder Metallurgy in the Automotive Industry."

1954 PASSENGER CAR PRODUCTION

As reported by the car factories

	February 1954	January 1954	February 1953	Two Months 1954	Two Months 1953
Chrysler	10,622	10,619	16,624	21,241	33,306
De Soto	6,445	8,323	10,761	14,768	20,553
Dodge	8,981	10,805	30,325	19,786	61,586
Plymouth	24,380	36,154	52,613	60,534	102,457
Total—Chrysler Group	50,428	65,901	110,323	116,329	217,906
Ford	115,995	118,677	76,195	234,672	155,244
Lincoln	3,759	4,581	801	8,340	4,684
Mercury	25,831	20,772	18,923	56,603	39,125
Total—Ford Group	145,585	154,030	95,619	299,615	199,053
Buick	42,802	38,083	39,757	80,885	77,948
Cadillac	9,510	4,019	9,939	13,529	19,250
Chevrolet	110,583	117,025	114,575	227,618	215,911
Oldsmobile	32,133	19,795	27,033	51,928	84,325
Pontiac	30,740	32,834	31,367	63,574	62,046
Total—G. M. Group	225,778	211,756	222,671	437,534	429,480
Henry J	932	26	1,426	958	2,512
Kaiser			2,631		4,584
Willys	1,439	43	4,401	1,482	10,226
Total—Kaiser Group	2,371	69	8,458	2,440	17,322
Hudson	1,302	2,078	8,499	3,380	14,802
Nash	6,256	8,570	18,630	14,826	34,931
Packard	4,018	3,699	10,053	7,717	20,937
Studebaker	7,475	10,624	10,923	18,099	18,360
Total—All Makes	443,215	456,727	485,176	899,942	950,791

1954 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the January, 1954 Total

MAKE	January 1954	December 1953	January 1953	Per Cent of Total: January 1954	Per Cent of Total: January 1953
Chevrolet	82,233	83,020	69,933	24.14	18.12
Ford	81,413	100,613	76,617	23.90	19.84
Plymouth	33,362	47,221	47,002	9.79	12.17
Pontiac	24,655	25,061	28,845	7.23	6.95
Mercury	23,860	27,932	19,831	7.00	5.13
Buick	23,679	26,739	26,102	6.95	6.76
Oldsmobile	13,777	21,223	15,798	4.04	4.87
Dodge	11,583	18,075	21,604	3.40	5.59
Chrysler	9,033	12,042	11,702	2.65	3.03
Studebaker	7,884	10,509	11,704	2.31	3.03
De Soto	6,964	9,658	9,356	2.04	2.42
Nash	5,784	7,756	12,763	1.70	3.30
Packard	4,094	3,174	6,450	1.20	1.67
Cadillac	3,219	9,433	8,118	.94	2.10
Hudson	2,941	4,177	5,316	.86	1.38
Lincoln	2,669	2,513	2,929	.78	.76
Willys	1,404	1,957	4,416	.41	1.14
Kaiser	479	730	2,621	.14	.68
Hillman (British)	251	303	383	.07	.09
Jaguar (British)	227	220	364	.07	.09
MG (British)	215	312	563	.06	.15
Henry J	160	248	1,302	.05	.34
Ford (British)	133	188	467	.04	.12
Austin (British)	126	161	342	.04	.09
Morris (British)	91			.03	
Allstate		2			
Miscellaneous Domestic	115	112	151	.03	.04
Miscellaneous Foreign	437	560	542	.13	.14
Total—All Makes	340,788	413,937	386,221	100.00	100.00

* Based on data from R. L. Polk & Co.

News of the AUTOMOTIVE

1954 RETAIL CAR SALES BY PRICE GROUPS*
NUMBER OF CARS

Price Group	January 1954 Units†	January 1954 % of Total	January 1953 Units†	January 1953 % of Total
Under $2,000	203,727	60.04	206,341	53.81
$2,001 to $2,500	90,364	26.63	104,994	27.38
$2,501 to $3,500	33,353	9.83	54,352	14.17
Over $3,500	11,864	3.50	17,786	4.64
Total	339,308	100.00	383,473	100.00

DOLLAR VOLUME OF SALES*

Price Group	January 1954 Dollars	January 1954 % of Total	January 1953 Dollars	January 1953 % of Total
Under $2,000	$371,124,726	52.21	$372,549,686	45.41
$2,001 to $2,500	205,286,500	28.88	233,905,958	28.51
$2,501 to $3,500	91,107,163	12.82	147,329,329	17.96
Over $3,500	43,295,499	6.09	66,585,534	8.12
Total	$710,815,888	100.00	$820,371,117	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	January 1954	December 1953	January 1954	Per Cent Change: January over December	Per Cent Change: January over January 1953
1	New England	17,885	20,026	20,350	−10.79	−12.21
2	Middle Atlantic	61,011	79,091	60,865	−22.86	+ .24
3	South Atlantic	45,572	53,004	48,705	−14.02	− 6.43
4	East North Central	86,450	101,723	101,709	−15.01	−15.00
5	East South Central	17,046	22,884	19,232	−25.51	−11.37
6	West North Central	30,451	41,443	32,169	−26.52	− 5.34
7	West South Central	36,234	45,228	44,158	−19.89	−17.94
8	Mountain	10,583	13,094	13,062	−19.33	−19.26
9	Pacific	35,596	37,444	45,951	− 4.94	−22.53
	Total—United States	340,788	413,937	386,221	−17.67	−11.76

States comprising the various regions are:—Zone 1; Conn., Me., Mass., N. H., R. I., Vt.—Zone 2; N. J., N. Y., Pa.—Zone 3; Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4; Ill., Ind., Mich., Ohio, Wis.—Zone 5; Ala., Ky., Miss., Tenn.—Zone 6; Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7; Ark., La., Okla., Tex.—Zone 8; Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9; Cal., Ore., Wash.

JET TRANSPORT

This scale model of the Boeing jet transport reveals its general external details. The four-jet, 190,000 lb plane is 128 ft long, and its wings measure 130 ft from tip to tip. Cruising speed is said to be in the 550-mph class.

Convair, General Dynamics Merger to Be Decided Soon

According to present plans, stockholders of both companies will meet April 29 to approve or disapprove a merger of Consolidated Vultee Aircraft Corp. and General Dynamics Corp. The proposal has already been voted by directors of both firms. No changes in the management or among the officers of either corporation are planned. Convair would retain its name, individual identity, and organization structure.

Chrysler Now Testing New Gas Turbine Unit

Chrysler Corp. has announced development of a gas turbine engine that is said to be capable of operating a current model automobile in city or highway traffic. It is now undergoing road tests at the company's proving grounds in a 1954 Plymouth Belvedere sport coupe.

Key component of the engine is a new type of heat exchanger or regenerator which utilizes most of the heat usually discharged as waste by gas turbines, according to Chrysler. The unit, which the company states is not ready for general use as yet, together with its set of reduction gears, measures 32 in. long, 33 in. wide, and 28 in. high. It is rated at 120-shaft hp.

Ford Offers Automatic Top for Convertible

Ford Motor Co. has announced a new accessory for its convertible. It is an actuator which automatically raises a convertible top at the touch of a drop of rain or snow.

The device can be mounted on the left front fender or on the sun visor. A rain drop on the control grid makes an electrical contact which starts the motor that operates the top.

A control box for the device is located on the left side of the engine compartment, and a wiring circuit has been designed to prevent the top from going up while the ignition switch is on. This safety control precludes raising the top while the car is in motion, according to the company.

AND AVIATION INDUSTRIES

HARVESTER LOW-COST PICKUP TRUCK

International Harvester Co. has introduced this half-ton pickup in two 115-in. wheelbase models; the R-100 has a GVW rating of 4200 lb, while the R-102 has one of 4600 lb. The truck is powered by a new 104-hp Economy Silver Diamond Six engine.

Car Dealers' Profits Drop 50 Per Cent During 1953

Overall profits of car dealers in 1953 dropped from 4.4 per cent of sales at the end of the first quarter to 2.2 per cent at the end of the fourth quarter, the National Automobile Dealers Association reports. The association attributed the profit loss to higher inventories of used cars and the losses sustained on them as a result of declining prices.

Borg-Warner Enters The Plastics Field

An entry into the plastics field has been made by Borg-Warner Corp. with the recent announcement that one of its subsidaries, Marbon Corp., is now producing a multi-purpose resin. It is said to have high impact resistance and offer good performance over a fairly wide temperature range.

The thermoplastic resin, called "cycolac," has already been molded into a number of products on a trial basis. The company expects to adapt it to use in such applications as air conditioner fittings and automotive components.

Pontiac Drops Output Of Only Truck Model

It has been disclosed that the Pontiac truck was quietly dropped at the end of last year. GM reportedly discontinued production of the panel delivery sedan because of a limited market for this type of vehicle.

1954 MOTOR VEHICLE FACTORY SALES*

	Passenger Cars	Trucks	Buses	Totals 1954	Totals 1953
January	453,378	96,167	401	549,946	585,172

1954 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	45,560	17,492	3,606	17,735	3,650	4,847	3,287	96,167

*—Automobile Manufacturers Association.

AI TABLOID

Howard Foundry Co. is opening a new "lost wax" Precision Investment Casting Div. in Los Angeles. . . . Stillman Rubber Co. has opened a Cleveland Div.

* * *

Ross Gear & Tool Co. has licensed the German firm of Alfred Teves, A. G., to manufacture its cam and lever manual and Hydrapower steering gears for German passenger cars and commercial vehicles.

* * *

Alloy Rods Co. has dedicated its Pacific Coast Div. plant. . . . Pacific Automotive Corp. has separated its manufacturing operations into two new divisions.

* * *

Hercules Powder Co. is offering a movie on industry's use of hot lacquer. Prints for showing are available from Cellulose Products Dept., 964 Market St., Wilmington, Del.

* * *

Worthington Corp. has acquired L. J. Mueller Furnace Co. . . . Holley Carburetor Co. has moved its general offices to 11955 Nine Mile Rd., Van Dyke, Mich.

* * *

Boeing Airplane Co. is using plaster casts instead of blueprints in tooling up for B-52 Stratofortress production.

* * *

Speedway Petroleum Corp. is plugging an Ethyl gasoline refined with Multipropyl Phosphate.

* * *

Scintilla Div. of Bendix Aviation Corp. is completing an addition of 33,000 sq ft to its Sidney, N. Y., plant. . . . Detroit Stamping Co. has finished an 11,000 sq ft addition to its main Detroit plant.

* * *

Jaguar Cars, Ltd., has formed a wholly owned subsidiary—Jaguar Cars North American Corp.

News of the AUTOMOTIVE

note: In Virginia-Legislation will be required to clarify State and Private Corporations participation.
note: In Georgia-Atlanta-Chattanooga section must be completed first.
note: Legislature held that part north of Stuart in abeyance until Miami-Stuart was completed.
TOLL ROADS
OPEN TO TRAFFIC
UNDER CONSTRUCTION
BONDS SOLD
LIMITED ACCESS FREEWAY AVAILABLE
LEGISLATION PASSED
GOVERNORS CONFERENCE HELD
DESIRABLE STUDIES NOT YET AUTHORIZED
POSSIBILITIES MENTIONED
note: Discussions have been conducted on legislation in Iowa, Tennessee, Kentucky California, Maryland, Delaware. Legislation was defeated or postponed in these states

Courtesy of "Oil Daily"

TOLL ROAD TREND CONTINUES STRONG

Some conception of the growing nation-wide interest in toll roads as a partial solution to the traffic problem may be gained from the above map of the Eastern and Mid-Western U. S. Other such projects probably will develop in the future.

1954 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the January, 1954 Total

MAKE	January 1954	December 1953	January 1953	Per Cent of Total January 1954	Per Cent of Total January 1953
Chevrolet	21,326	21,393	25,174	35.12	34.66
Ford	18,825	25,013	18,329	31.01	25.25
International	6,082	6,284	7,737	10.02	10.67
G. M. C.	5,193	4,971	7,088	8.55	9.73
Dodge	5,140	6,159	7,655	8.47	10.54
Studebaker	864	968	2,210	1.42	3.04
White	859	915	780	1.42	1.07
Willys Jeep	550	792	826	.91	1.14
Mack	437	458	490	.72	.67
Willys Truck	422	527	1,038	.70	1.43
Diamond T	206	240	247	.34	.34
Divco	204	211	149	.34	.21
Reo	181	235	283	.30	.39
Brockway	99	152	154	.16	.21
Autocar	92	104	95	.15	.13
Kenworth	52	27	52	.09	.07
Federal	34	91	127	.06	.17
F. W. D.	33	28	38	.05	.05
Peterbilt	24	8	21	.04	.03
Pontiac		26			
Miscellaneous Domestic	69	43	102	.11	.14
Miscellaneous Foreign	15	14	32	.02	.04
Total—All Makes	60,706	68,659	72,606	100.00	100.00

* Based on data from R. L. Polk & Co.

Spicer Anniversary Booklet Covers History, Products

In connection with the celebration of its 50th anniversary this year, Spicer Manufacturing Div. of Dana Corp. has published an illustrated booklet depicting the company's growth throughout the years. Feature treatment is given to the firm's broad range of automotive products, which include universal joints, clutches, transmissions, propeller shafts, power take-offs, axles, and torque converters.

Spicer, the booklet points out, was founded in 1904, formed into a corporation in 1916, and became a major division of Dana Corp. in 1946. The parent firm today operates 10 modern plants located in nine eastern and mid-western cities.

The Spicer plant in Toledo, O., produces heavy-duty universal joints and propeller shafts, as well as transmissions, railway generator drives, torque converters, and related materials. Spicer plants in Pottstown, Pa., and Marion, Ind., turn out universal joints and propeller shafts exclusively, while the Salisbury Axle Div. in Fort Wayne, Ind., produces the Spicer Salisbury Axle.

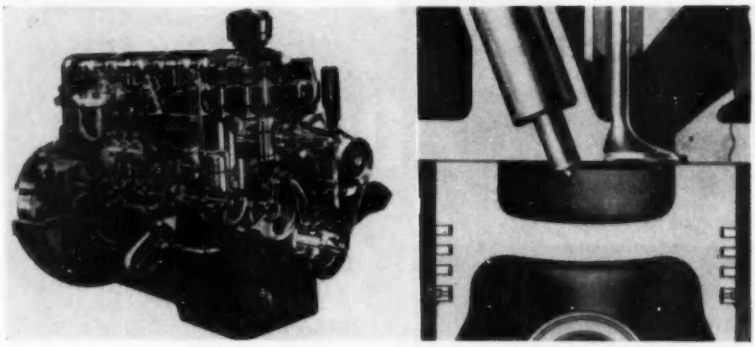
Other important divisions of Dana Corp. described in the publication are: Auburn Clutch Div., Auburn, Ind.; Aircraft Gear Div., Fort Wayne, Ind.; Hillsdale Steel Products Div., Hillsdale, Mich.; Parish Pressed Steel Co., Reading, Pa.; General Drop Forge Corp., Buffalo, N. Y.; and Atlas Drop Forge Co., Lansing, Mich.

Copies of the booklet are available to responsible executives of firms engaged in the manufacture of automotive vehicles. Requests for copies should be made on company letterheads to: Spicer Manufacturing Div., Dana Corp., Toledo 1, O.

LeTourneau-Westinghouse to Build Brazilian Plant

LeTourneau-Westinghouse Co. has announced that it will build a new plant in Brazil about 60 miles from Sao Paulo. It will be the property of Tratores do Brasil S.A., newly established operating subsidiary of LeTourneau-Westinghouse.

AND AVIATION INDUSTRIES



British Ford Diesel with circular combustion chamber machined in piston crown.

Diesel Engine Now Available On British Ford Truck Line

British Ford is now offering on its two- and three-ton Thames trucks a novel OHV Diesel (see cut) designed as an alternative to the gasoline unit. This four-cyl engine of 220 cu in. piston displacement is rated at 60 bhp at a maximum governed speed of 2400 rpm. Bore is 3.94 in., stroke 4.52 in., and compression ratio 16:1. Maximum torque is 150 lb ft at 1600 rpm.

A circular combustion chamber is machined in the crown of the aluminum alloy pistons. These are fitted with three compression and two oil rings; skirts are tapered and camground. Replaceable wet cylinder liners are used. Crankshaft and camshaft both have five bearings which are pressure-lubricated; exhaust valves are rotating.

The fuel injector pump incorporates a pneumatic governor. A sliding-vane exhauster driven from the injection pump provides the vacuum for the servo-assisted brakes on the three-ton truck. Air from the exhauster is passed into the crankcase to improve ventilation.

The engine has three-point suspension on rubber and, in addition, is fitted with a hydraulic stabilizer between engine and chassis frame. Extra cost of the Diesel is $238 when fitted to the two-ton model and $280 on the three-ton line.

The cigar-shaped Bellanca plastic target has an overall length of 19 ft and is said to have the same radar reflective characteristics as a B-29 bomber. It is painted red with a yellow stripe running down each side and can be towed some distance behind plane.

Mobilgas Economy Run Set for Early Part of Month

The 1954 Mobilgas Economy Run, scheduled to take place April 5 to 8 between Los Angeles and Sun Valley over an as yet unrevealed route, will again use the ton-mile-per-gallon yardstick for determining the winners. Participating stock cars will be divided into low, low-medium, upper-medium, and high-price categories. In addition, a special class for lightweight vehicles will be open.

Automobiles of the first three above classes will be proportioned among standard and overdrive transmission-outfitted vehicles and those with automatic transmissions. All entrants in the high-price class will be equipped with automatic transmissions.

Bellanca Aircraft Develops Reinforced Plastic Target

Another example of the wide range of applications being found for reinforced plastics is the development by Bellanca Aircraft Corp. of a towed target for aerial gunnery (see cut). Made of reinforced fiberglass mats impregnated with a modified polyester resin, the target has a total weight of 300 lb, including ballast, and is currently under test by Army Ordnance.

Plastic shell of the target with fins and stabilizer alone weighs 145 to 150 lb and is designed to carry a considerable amount of electronic equipment, as well as a parachute. According to Bellanca, the unit can easily be repaired and will float for a reasonable period of time if shot down over water. The company is also experimenting with reinforced plastics for possible fuselage and wing section applications.

Aside from its work on 25 of the experimental targets, which will cost under $1,000 a unit in volume production, Bellanca is also currently engaged in turning out a number of components on a subcontract basis for other aircraft companies. Second, it is laying plans for resuming output of its four-place executive transport plane in the near future. It is also studying designs for turboprop military cargo planes, which reportedly will use the turbomecca-type engine of Continental Motors Corp.

Men in the News

Detroit Diesel Engine Div., General Motors Corp. — George M. Forsythe has been appointed manager of all sales to Government agencies

Shuler Axle Co. — Richard C. Carson has been appointed vice-president in charge of engineering.

Plymouth Motor Corp. —Carl J. Demrick has been elected vice-president in charge of manufacturing.

Binks Mfg. Co.—Henry C. Binder is now made personnel manager.

Aeroquip Corp.—Dogan H. Arthur has been made assistant aircraft sales manager, and Joseph R. Roberts has become advertising manager.

Eaton Mfg. Co.—John F. Romans has been named to the central staff of the firm.

New Departure Div., General Motors Corp.—**Matthew C. Wagner** has become supervisor of sales training.

Chambersburg Engineering Co.—**Kenneth W. Palmer** has been advanced to vice-president and continues as treasurer; **C. Douglas Galloway III** has become secretary and works manager; and **George H. Martin** is now foundry superintendent.

Denison Engineering Co.—**Robert R. Hyatt** has been appointed director of industrial relations.

Hamilton Standard Div., United Aircraft Corp.—**Carl F. Baker** has been named quality manager with **Nevin F. Decker** as his assistant; **Wilfred H. Shaw**, chief inspector; **William E. Diefenderfer**, assistant chief engineer in charge of design and development; **Ermano Garventa**, chief development engineer; **Thomas F. Farkas**, chief design engineer; **David R. Pearl**, design engineer; **W. E. Fortmann**, senior project engineer; **Robert L. Mettey**, supervisor, field service engineering for commercial installations; **Vernon Hupp**, supervisor, field service engineering for military installations; and **Leonard Cooke**, assistant purchasing agent.

Willys Motors, Inc., Aluminum Forge Div.—**Walter E. Streeter** has become general manager; **Andrew M. Mitchell**, chief engineer; and **Robert C. Heiden**, production superintendent.

Greibach Instrument Corp. — **Dr. Emil Greibach** has been chosen head.

Westinghouse Electric Corp. — **Roger H. Bolin** has been appointed manager of general advertising.

Dayton Rubber Co.—**J. D. Hershey** has become director of sales promotion and advertising; and **R. L. Wetzel** is now director of public relations.

Standard Products Co.—**James M. Henry** has been promoted to director of purchases. **Raymond C. Zook** was named to succeed him as manager of the Gaylord, Mich., Div.

Pennsylvania Salt Mfg. Co. — **Charles R. Sorber, Jr.**, has been made Cincinnati district supervisor for the Metal Processing Dept.

Fairchild Engine & Airplane Corp., Speed Control Div.—**William L. Smith** has been made general manager.

Glass Fibers, Inc.—**William L. Whitcomb** has been promoted to advertising manager.

LeTourneau - Westinghouse Co. — **R. N. Turner** has been chosen railroad sales manager.

Parker Appliance Co.—**Walter C. Loeman** was named manager of The Tube and Hose Fittings Div., while **James F. Davis, Jr.**, succeeds him.

United States Rubber Co., Tire Div. —**Herbert D. Smith** has been made manager of oil marketer sales. He replaces **Lawler B. Reeves**, who has been named special assistant to the president.

Fredric B. Stevens, Inc.—**F. W. Kittrell** has joined the firm as process and sales engineer on industrial waste disposal.

Flexonics Corp.—**George R. Birkelund, Percy W. Bowers**, and **Thomas K. Wells** have been elected directors.

Owens-Ford Glass Co. — **Charles Shelly** has been named general manufacturing superintendent of the Thermopane plant, while **George P. MacNichol, III**, has become production manager.

General Electric Co.—**Walter M. Seibel** has been named supervisor of employee services, and **Frank A. Thorn** employment supervisor.

Dodge Div., Chrysler Corp.—**Victor Frederiksen** has been appointed chief industrial engineer. **Albert L. Wilson** succeeds him as plant engineer.

Fairchild Engine & Airplane Corp., Engine Div.—**Thomas M. Sullivan** has been made West Coast representative.

Lear, Inc.—**Chester D. Seftenberg** has been named treasurer.

Mullins Mfg. Corp.—**Lee C. Sassmanhausen** has been named works manager of the Liberty plant.

Illinois Tool Works, Shakeproof Div—Russell W. Bill was appointed sales manager.

Chambersburg Engineering Co.—Eugene C. Clarke, Jr. has been advanced to general manager.

New Departure Div., General Motors Corp.—Robert H. Wilkie was chosen supervisor of sales promotion.

Denison Engineering Co.—Paul W. Norris was named director of sales, and Robert H. Krepps was promoted to sales manager of the organization.

Studebaker Corp.—Paul M. Clark has been elected vice-president in charge of industrial relations, and A. H. McChesney has become chief inspector for all manufacturing operations.

Minneapolis-Honeywell Regulator Co., Brown Instruments Div.—C. L. Peterson is now divisional vice-president while O. B. Wilson is general sales manager.

Superior Steel & Malleable Castings Co.—**W. Merritt Jones** and **Jack Cowan** have become sales representatives in the greater Detroit area, Port Huron, Pontiac and Toledo.

Chandeysson Electric Co.—**Ralph Morse** is now plant engineer.

Standard Pressed Steel Co.—**Francis J. Kinsella** has been named manager of outside sales.

Dodge Div., Chrysler Corp.—**James H. Brooks** was made regional manager-trucks of the Boston region.

Piasecki Helicopter Corp.—**Elliott Daland** has resigned as vice-president, but will continue as an engineering advisor.

E. W. Bliss Co.—**Edward H. Farmer** has been appointed plant manager of the San Jose, Calif., works.

Chrysler Corp., Engineering Div.—**Lovell Lawrence, Jr.**, has been made head of power plant design in the Missile Branch; **Frederick B. Cline**, design staff engineer, and **Glen M. Aron**, standards engineer.

General Motors Corp.—**Charles T. Fisher, Jr.**, has been elected a member of the board.

Fruehauf Trailer Co.—**R. E. Isaacson** has been elected director of branch operations.

General Electric Co.—**Dr. Edward A. Kern** is now manager-engineering for the Silicone Products Dept.

American Steel & Wire Div., U. S. Steel Corp.—**James K. Sedgwick** has been appointed assistant manager of merchant products sales.

Fisher Body Div., General Motors Corp.—**Guy J. Bates** is now manager of the Cleveland plant.

Olin Industries, Inc.—**Henry H. Hunter** has been named product publicity supervisor.

Hyatt Bearings Div., General Motors Corp.—**Martin A. Moore** has become manager of the plant at Clark Township, N. J., and **Edward S. Clymer** is now manager of the Harrison, N. J., plant. **Leo V. Farrell** has been promoted to general production manager of the division, while **C. Russell Todd** was named general purchasing agent. Promotions at the Harrison plant included: **John S. Marratt**, manufacturing superintendent; **John S. Garden**, superintendent, radial bearings; **William Rossetti**, superintendent, defense production; **Robert R. Guempel**, director of production engineering; **Theodore A. Olson**, production engineer; and **Edward L. Nelson**, supervisor of methods, plant layout and process engineering. Clark Township plant promotions included: **Theodore A. Jagen**, manufacturing superintendent; **John Antoniotti**, chief inspector; **Franklin P. Hegeman**, production engineer; **Henry L. Davey**, assistant production engineer; and **James Laughlin**, supervisor of methods and plant layout.

Bingham Technical Advertising—**Robert J. Fitz Gibbon** has been appointed assistant to the president.

Soss Mfg. Co.—**Andrew TenEyck** has been elected vice-president in charges of sales, and **John A. O'Brien**, vice-president of manufacturing.

Necrology

Frederick U. Conard, 63, president and general manager of the Pratt & Whitney and Chandler-Evans Divs. of Niles-Bement-Pond Co., as well as president of Potter & Johnston Co. (subsidiary), died March 14, at West Hartford, Conn.

T. E. Myers, 80, vice-president of the Indianapolis Motor Speedway, died March 13, at Indianapolis, Ind.

Frederick G. Dawson, 61, executive assistant to the general manager of Sikorsky Aircraft Div., United Aircraft Corp., died March 8, at Westport, Conn.

Harold V. Wright, 54, managing director of Bristol Aeroplane Engines, Ltd., died March 2, at Montreal, Canada.

William J. Brinkerhoff, 67, former manager of the Direct Sales Div., U. S. Steel Export Co., died Feb. 25, in Florida.

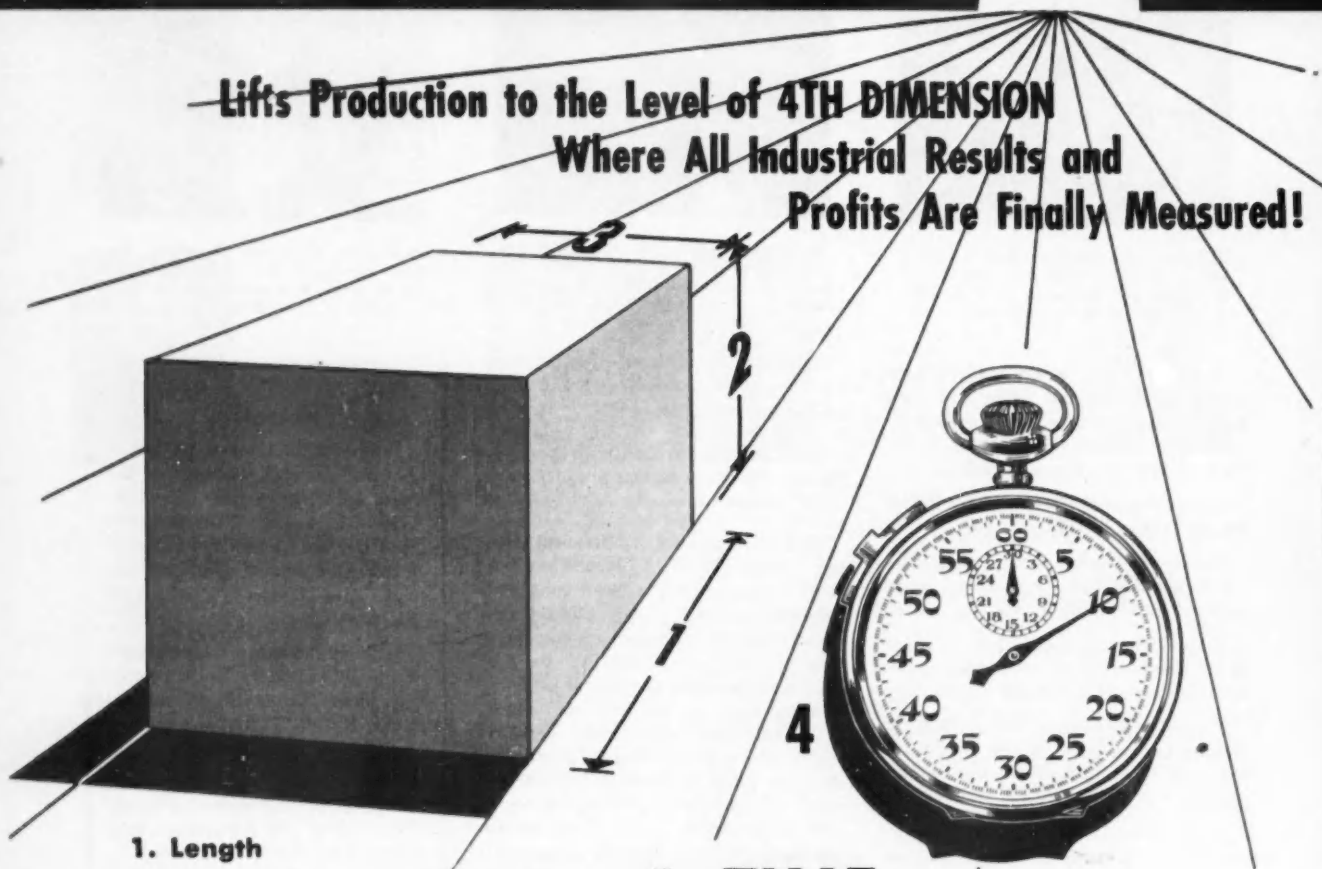
Forrest H. Hitchcock, 71, retired chief experimental engineer for Packard Motor Car Co., died Feb. 26, at Detroit, Mich.

George B. Woods, 57, aviation consultant, died recently at New York, N. Y.

Francis H. Brownell, 86, retired chairman of the board of American Smelting and Refining Co., died recently, at New York, N. Y.

New... A Screw-Machine-Feed

Lifts Production to the Level of 4TH DIMENSION Where All Industrial Results and Profits Are Finally Measured!



1. Length

2. Height 3. Width and 4. TIME

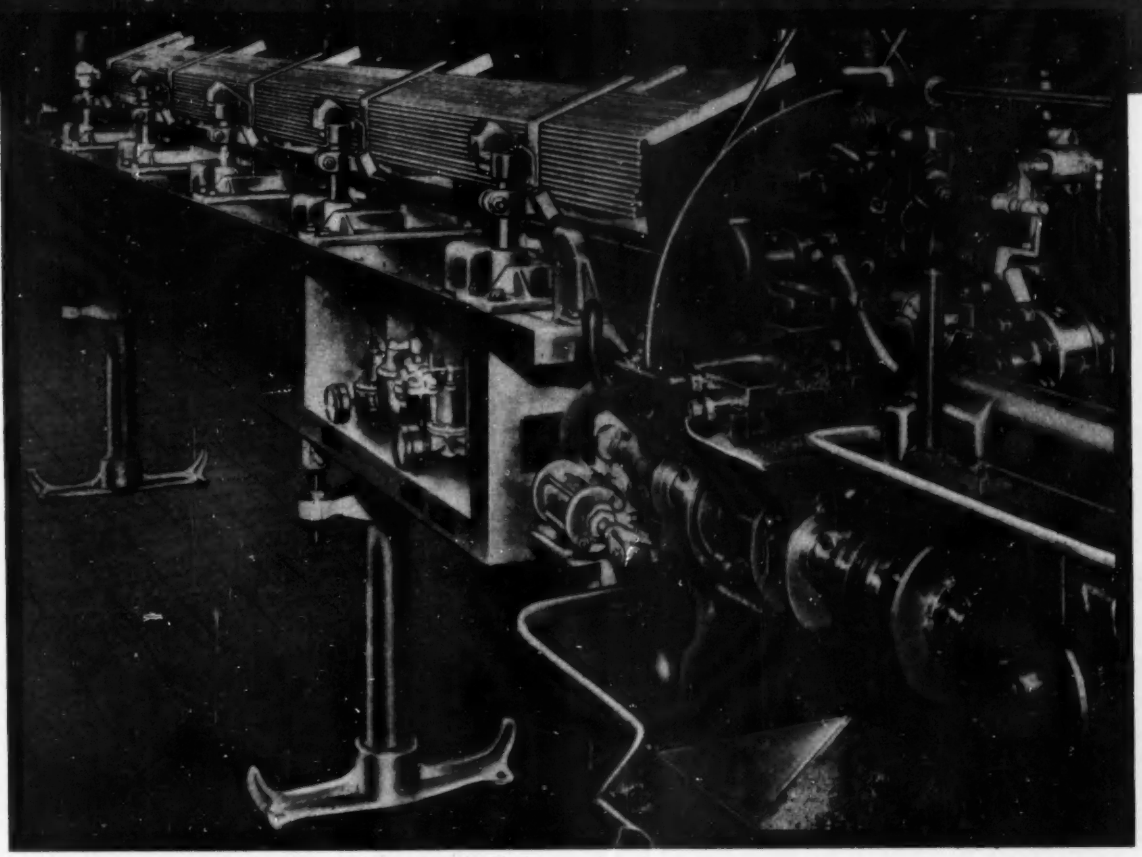
You're careful about 3-dimensional accuracy, of course. Precision to four decimal places in screw-machine output is commonplace. *But how about TIME, the important fourth dimension?* Measurement that determines all industrial results, costs, profits.

Production is a succession of motions, cycles, piece-to-piece operations. But it's the overall result in world time, the plant output of finished pieces per hour, day and week which add up to the *absolute reality* of success or failure, profit or loss.

In this modern Lipe Automatic Magazine-Loading Bar Feed, we present an automatic feed that derives from every man and every machine a smooth flow of operations, a steady-state succession of events in world time which mathematicians, scientists and philosophers know as the *Fourth Dimension.*

Actual production increases per man hour and machine dollar may seem large in contrast to your present output. But remember the Lipe AML Bar Feed gears a succession of normally non-uniform cycles to the steadily moving stream of TIME . . . *the dynamic 4th DIMENSION of both the production line and the universe.*

that BREAKS THE TIME BARRIER!



Lipe AML BAR FEED

Exploits the 4TH DIMENSION to Achieve
At Least 30% Increase in Production!...

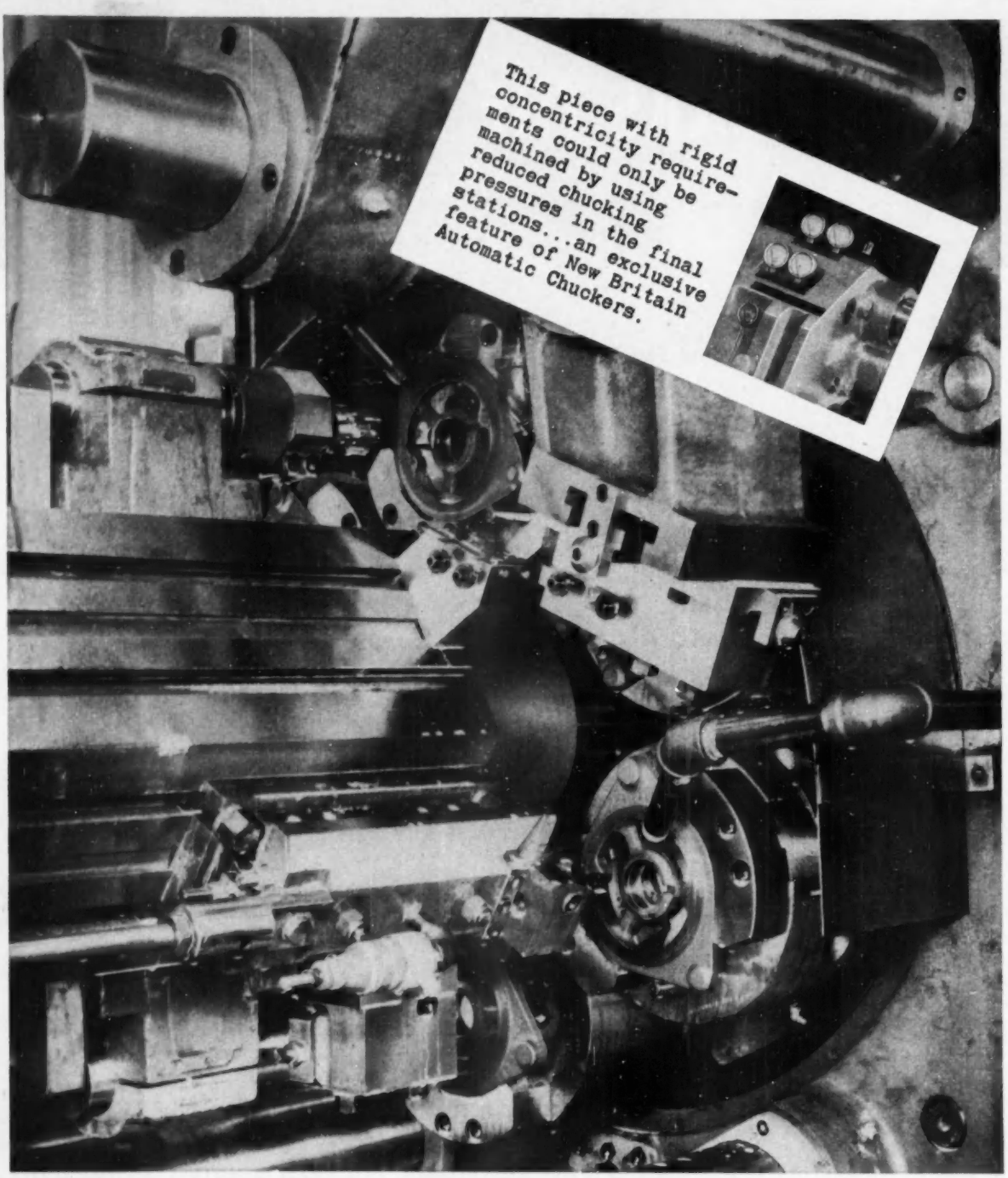
- **FEEDS STOCK *CONTINUOUSLY*—** ***No Time Lost*** **Cutting Air**
- ***ELIMINATES* FEED FINGERS—** ***No Time Lost*** **in Adjustments or Replacements**
- **EJECTS REMNANTS *AUTOMATICALLY*—** ***No Time Lost*** **in Remnant Disposal**
- **PERMITS *QUICK* SET-UPS—** ***No Time Lost*** **with Tricky Controls On Short or Long Runs**
- **SEE IT AT THE SHOW** — See the remarkable Lipe AML Bar Feed in action at the ASTE Show, Philadelphia, Pa., Booth #726. Or write for descriptive literature and list of well-known users.

LIPE ROLLWAY

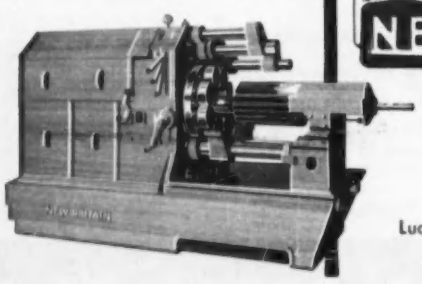
Lipe-ROLLWAY CORPORATION

Manufacturers of Automotive Clutches and Machine Tools

Syracuse 1, N. Y.


This piece with rigid concentricity requirements could only be machined by using reduced chucking pressures in the final stations...an exclusive feature of New Britain Automatic Chuckers.

Our general catalog is filed in the Sweet's Machine Tool Catalog File.



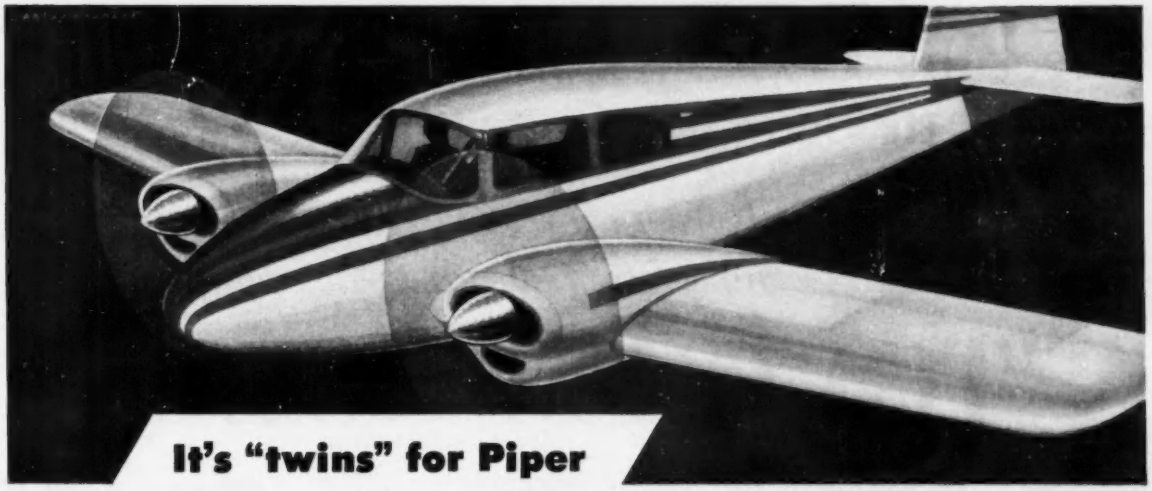
THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

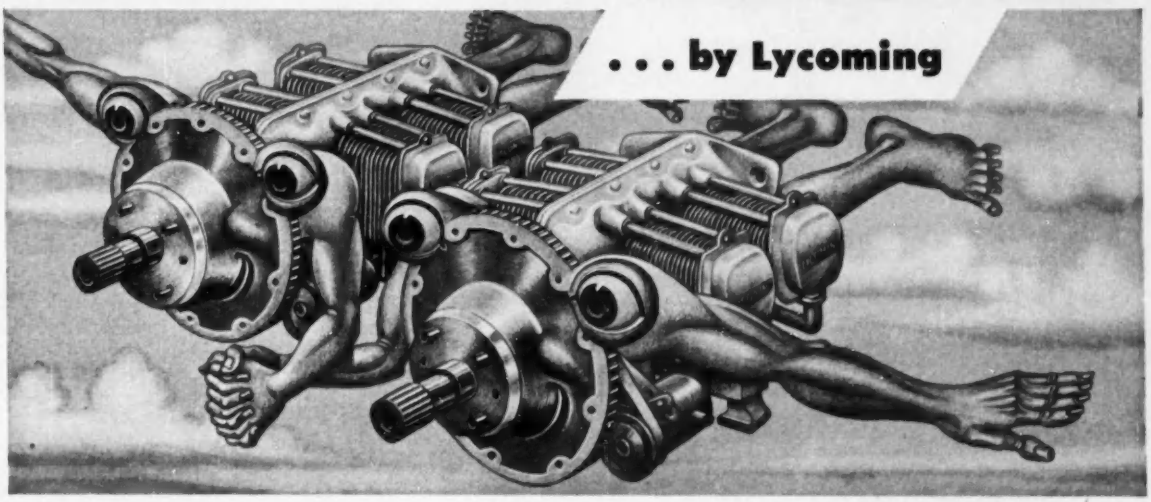
. . . Machines for Making Progress

Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes

NEW BRITAIN *Automatics*



It's "twins" for Piper



. . . by Lycoming

This is the Piper Apache . . . the all-new executive plane that brings new economy to the twin-engine field while maintaining high standards of safety and dependability.

It is powered by two proven Lycoming 150-h.p. air-cooled engines designed especially for the Apache. These power plants provide an improved horsepower-weight ratio, new compactness . . . and are so powerful that the Apache can safely fly and land with a full load *on one engine alone.*

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DIVISION OF AVCO MANUFACTURING CORPORATION
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Meet the BIG 4 in Reinforced Wheels

BFR **BD** **BN** **BF**

Famous Norton team features strength, versatility and safety . . . plus the value-adding

"TOUCH of GOLD"

BFR Semi-Flexible Hub-Type. Cotton fabric and Nylon reinforcement. Most popular light snagging wheel Also useful for weld smoothing, blending contours, light finishing, removing scale, notching gates and risers, minor cut-off jobs, etc. Reaches hard-to-get-at places.

Here's a Norton wheel family that's closely related in a number of ways that add up to better grinding jobs for *you*. Each has strong, laminated construction that provides much more than the usual margin of safety. Each is designed to cover a wide range of everyday grinding jobs. And each is engineered to give you fast, trouble-free, economical grinding — the true "Touch of Gold" — every time you put it to work.

The "Big 4" make up a well-balanced team, consisting of two sturdy hub-type wheels (BD rigid and BFR semi-flexible); one straight wheel (BF semi-flexible); and one cut-off wheel (BN). All are resinoid bonded.

The accompanying action shots can only hint at the "Big 4's" practically unlimited usefulness. Why not find out just how much time and money they can save you in your own grinding applications?

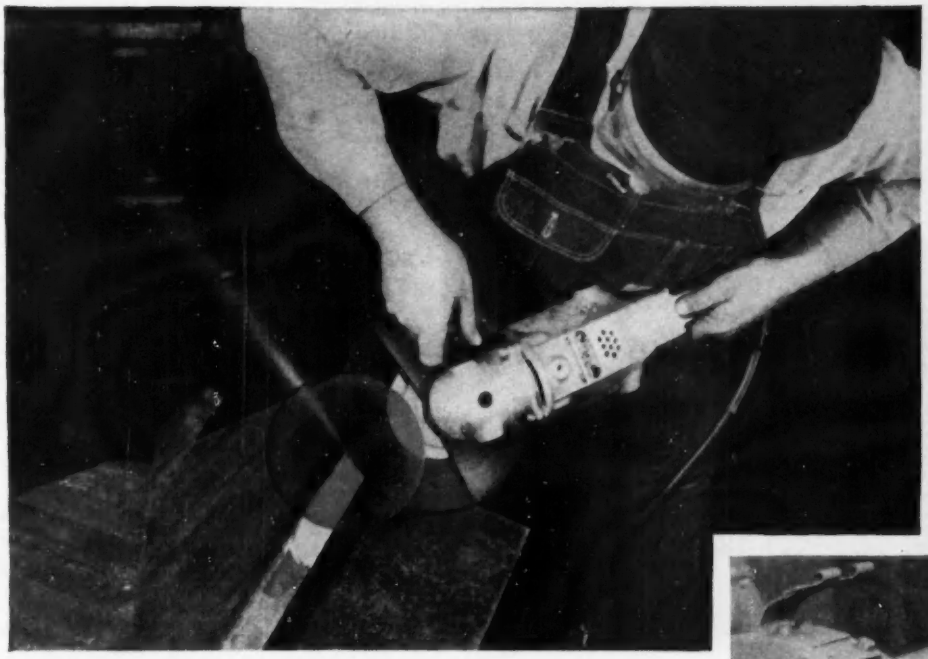
Ask Your Norton Distributor

to demonstrate Norton Reinforced Wheels in your shop. He knows the types and sizes of wheels you need, will be glad to help you in any grinding problems, and will call in a Norton Abrasive Engineer, if necessary. Or write to NORTON COMPANY, Worcester 6, Mass. for the Brand New Catalog on Reinforced Wheels. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1547

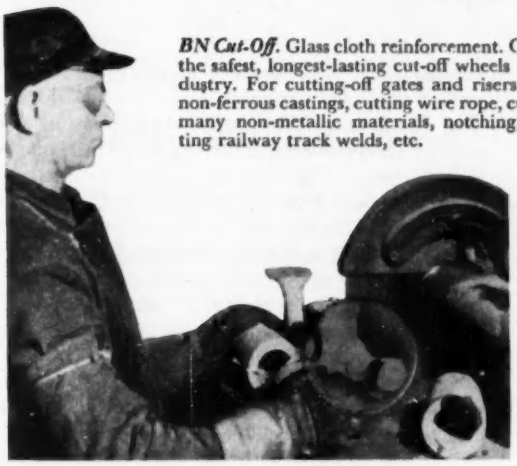
NORTON

ABRASIVES

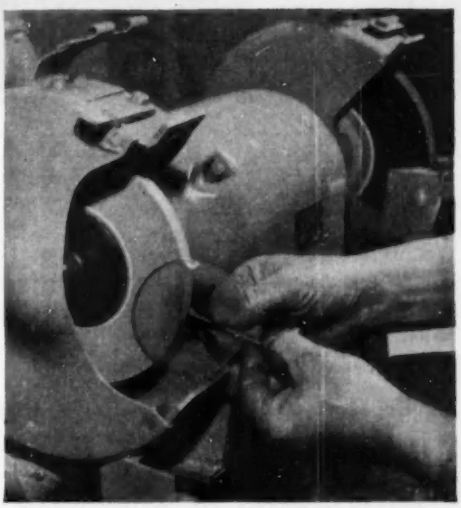
Making better products . . . to make other products better



BD Rigid Hub-Type. Glass cloth and Nylon reinforcement. For heavier stock removal, smoothing flame-cut edges, slotting, notching, cutting-off and many other jobs where finish is less essential. Bridges the gap between the BFR wheel and the conventional cup wheel for portable grinding.

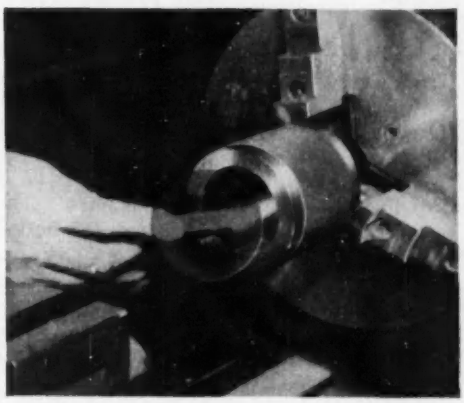


BN Cut-Off. Glass cloth reinforcement. One of the safest, longest-lasting cut-off wheels in industry. For cutting-off gates and risers from non-ferrous castings, cutting wire rope, cutting many non-metallic materials, notching, slotting railway track welds, etc.

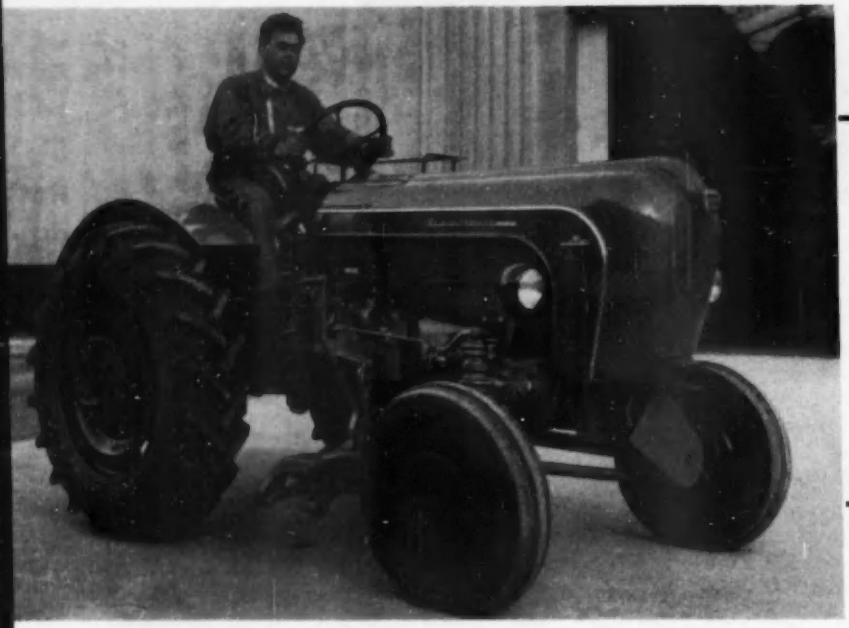


BF Semi-Flexible. A straight wheel with cotton fabric construction. Ideal for deburring jobs, including stampings too large for tumbling. Also for blending and smoothing light welds and curved surfaces, removing flash from plastics, etc. For grinding on periphery only.

BF Mounted Wheels and Points. Same laminated construction as BF wheels. Like all Norton mounted wheels and points they're trued on their own spindles. Available in a wide variety of sizes and shapes for polishing die cavities, chamfering, Brinnell spotting, etc.



BF Hand Sticks. Laminated construction, as in BF wheels and mounted wheels and points. These convenient sticks provide an easy method of final hand polishing in places where wheels and buffing devices can't reach.



Big Need For Tractors in France

German Allgaier tractor with four-cylinder, aircooled Diesel engine.

PARIS, FRANCE

THE 1954 French agricultural implement show, held recently in the suburbs of Paris, covered more than one million square feet of space and presented the exhibits of about 1000 firms, 225 of which were from outside of France.

At the present time France has 220,000 tractors in service, of which 115,000 are of foreign origin. Home production is growing, however, largely by the installation of assembly plants or complete factories on French territory. Last year 28,200 tractors were built in France, compared with 26,124 in 1952, and from 41 per cent national production in 1950, the proportion is now 76 per cent. Increase is not as rapid as might be hoped, owing to the matter of cost and the absence of any long-term Government policy on fuel taxation. In 1953 tractor production on the home market increased eight per cent, while the production of what are known as motoculture machines (small machines handled by a man afoot) increased 26 per cent. The industry is becoming highly concentrated, for 80 per cent of tractors produced last year were built by five firms.

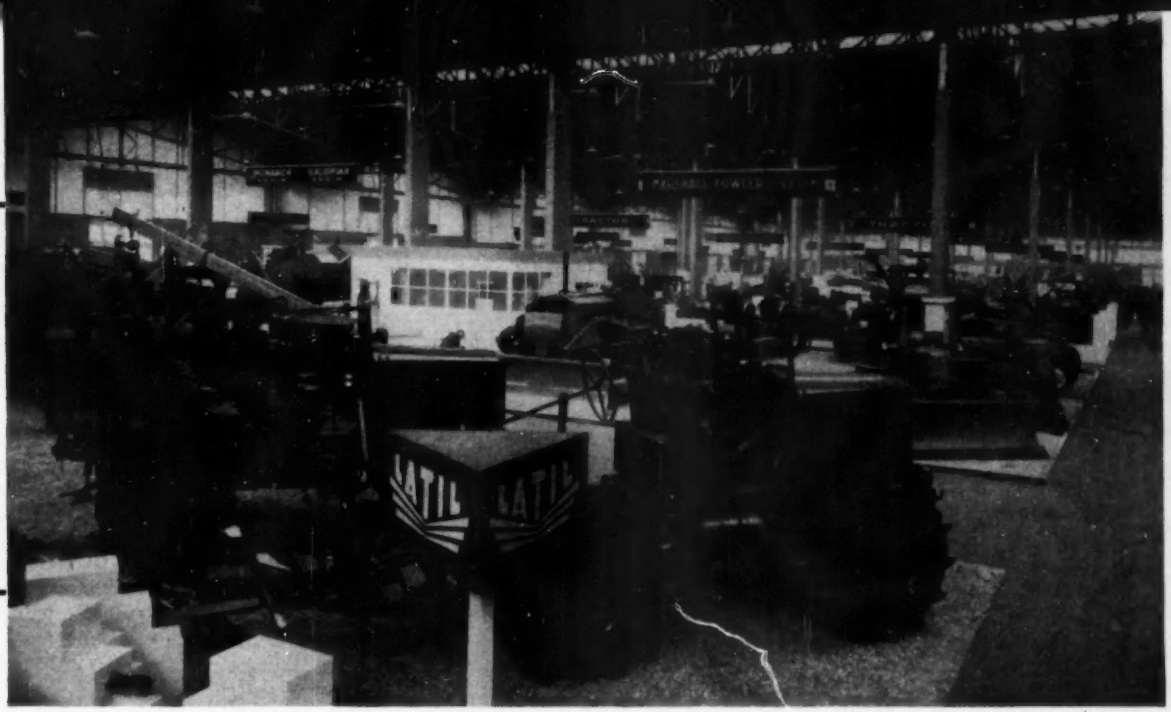
This show vividly reflected demands of the French farmers with their medium and small holdings, many of the latter being family operated. There is reduced use of specialized machines, and emphasis on the small or medium all-purpose tractor. The specialized machines cannot be produced profitably by home firms, thus of the 12,500 reapers and binders in service. 11,000 are imported. Prices have dropped on an average seven per cent since the beginning of 1952, due largely to better manufacturing facilities, although during the same period wages have risen 11 per cent.

The market offers immense possibilities of development, for it is estimated that of 4,300,000 agricultural holdings only about 300,000 make use of tractor power and of these only a small proportion do it effectively. The Food and Agricultural Organization estimates that by 1956 the number of tractors should be doubled. A weakness of the situation is that all the tractor manufacturers have to rely on outside agricultural implement makers, and many are producing tractors on such a small scale that they are dependent on other firms for their main components.

Because of the number of small, all-purpose machines, the Diesel does not have a numerical superiority. All the small motoculture machines, with rare exceptions, are equipped with a single or twin cylinder aircooled gasoline engine of four hp upwards. A majority of the French makers use the Bernard engine, of modern design, with valves in head, forged light alloy connecting rods, tapered roller bearings for the crankshaft, and adequate protection for all working parts. There are a number of installations, however, with exposed chains and other working parts which obviously cannot assure a long life under normal farming conditions.

Renault, largest French automobile manufacturer, is the only one devoting much attention to tractors. All are of the wheel type, but there is a variety of engines: the Renault gasoline unit of 145 cu in.; the 191 cu in. Perkins Diesel; or the Hercules, built by Hispano-Suiza, of 255 cu in. displacement.

Since their recent link-up, Massey Harris and Ferguson claim to be the biggest tractor manufacturers in France. Last year the former firm built 8240 tractors while Ferguson production or assembly was 2543, in addition to an importation of 952 complete units. The Ferguson is the British Standard organization, now linked up with Hotchkiss and using a portion of the Hotchkiss factory near Paris. The intention is to produce the whole of the Ferguson tractors



Record Number of Manufacturers Display Their Wares at Largest Implement Show

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

in France, but at present there is considerable assembly of parts imported from the Standard works at Coventry. Ferguson has four models, three of them powered by gasoline engines and one having the Standard Diesel. At its main factory near Lille, Massey-Harris is producing three main types of tractors: the Poney, fitted with the French Simca four-cylinder gasoline engine of 74 cu in. displacement (this model also is produced with narrow track for vineyard work); the Standard 744, with a 289 cu in. Diesel, also a similar Row-Crop model; and a creeper track reaper and bailer with a 66 hp, eight-cylinder Ford engine.

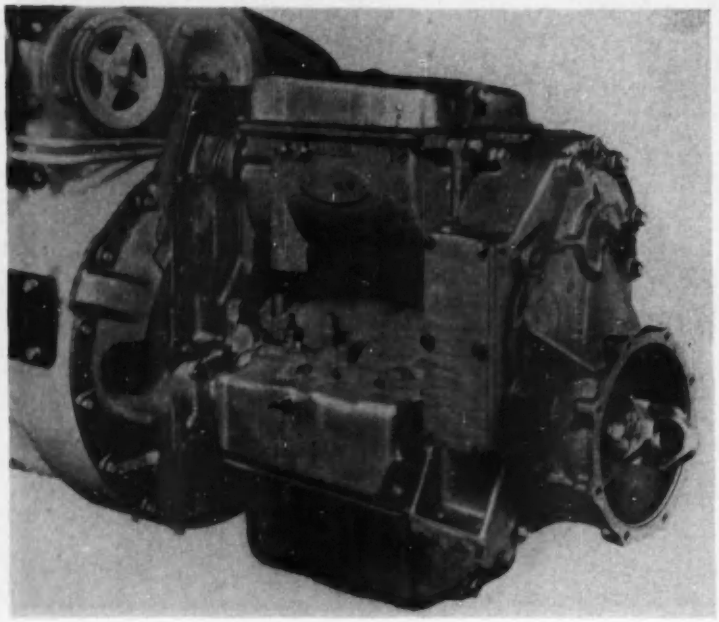
McCormick International, which had its own hall in the exhibition grounds, manufactured 6495 tractors in France last year, coming second to Massey-Harris, and imported nearly 300. Of its three factories in France the most important for tractor production is one at St. Dizier, in the east of France, considerably extended under Marshall Plan Aid, and where complete tractors soon will be built. All castings are made here and forging presses have recently been installed to enable the firm to produce its own crankshafts. There is a range of eleven tractors, from the Cub with a four-cylinder gasoline engine of 59 cu in. displacement to four creeper-track machines with Diesel engines of up to 690 cu in.

Someca, a unit in the Simca automobile group, built 1224 wheel type tractors last year. These are equipped with an imported O.M. (Fiat controlled) four-cylinder Diesel of 230 cu in. piston displacement. Because of its connection with the Italian firm, Someca shared a display with Fiat, but whereas the former showed almost completely French production the latter exhibited imported machines. These ranged from creeper track and wheel type units powered by 116 cu in. Diesels to a large bulldozer. A feature of this latter was the use of a built-in, two-cylinder gasoline engine for starting its 400 cu in. displacement, four-cylinder Diesel.

Ford displayed only the English series of tractors, imported under license. Last year's importations numbered 608, of which 40 were gasoline. Nuffield, David Brown and Enfield, the latter with one and two-cylinder aircooled Diesels, also appeared among the importers from England. Singer, of Birmingham, introduced the Monarch medium tractor, equipped with a Ford 71 cu in. four-cylinder gasoline engine.

Germany was well represented. Characteristic of that country's displays was the greater use of Diesel engines, of all sizes, compared with other nationalities. The Allgaier tractors, built at Uhingen, Wuerttemberg, to the designs of the late Dr. Ferdinand Porsche, attracted attention because of the interchangeability throughout the five wheel type models, the smallest of which had a vertical aircooled single cylinder engine of 110 cu in. displacement. It is claimed that 78 per

(*Turn to page 72, please*)

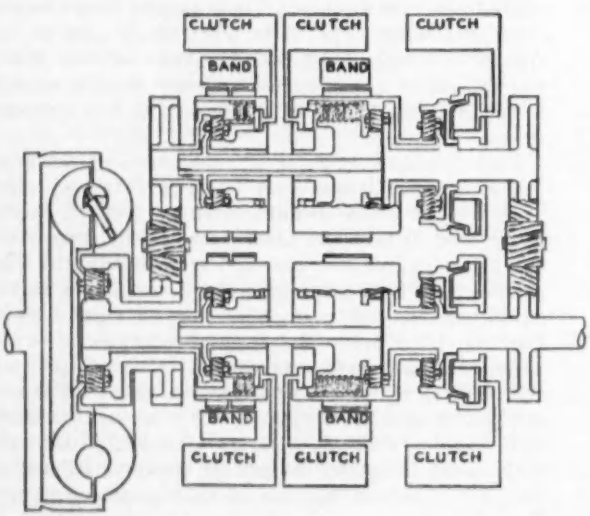


The GMC Twin Hydra-Matic drive in which two truck type H-M transmissions are mounted one over the other with a single output shaft from the lower unit.

Twin Hydra-Matic Provides Multiplicity of Gear Ratios

THE long awaited announcement of an automatic drive for heavy duty trucks, combining automatic shifting with sufficient multiplicity of gear ratios to meet heavy duty hauling requirements has been made by GMC Truck and Coach Div., General Motors Corp. First application of Twin Hydra-Matic drive is on the GMC Diesel model DFM-660-47, a C-O-E highway tractor rated at 60,000 lb GCW. It will be made available later in other 150-hp models, and eventually will be adapted for GMC gasoline and Diesel models in the 175-225-hp range.

The Twin Hydra-Matic transmission consists of two Hydra-Matic units, mounted in a case of hourglass form, one above the other. This combination provides seven closely spaced forward gear ratios and one reverse, shifting automatically in a manner somewhat similar to the usual operation of the Hydra-Matic drive. A three-speed reduction gear box is mounted behind the automatic drive, connected by a short propeller shaft, providing three driving ranges at the option of the driver. Although theoretically this combination is capable of 21 different gear ratios, in actual operation there are certain overlapping gear ratios in each range with the result that usually the combination will provide a maximum of some 13 distinct gear changes and three reverse.

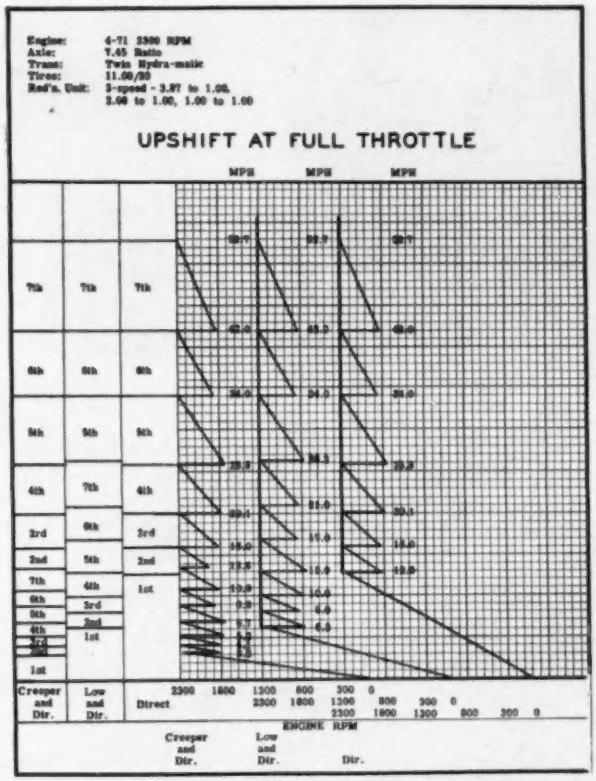


Schematic drawing of the Twin H-M drive, showing the single fluid coupling on the lower unit, connected to the upper unit with a planetary gear box and gear set. The output end of the upper unit is connected to the lower output shaft through another gear train.

As illustrated, the main drive consists of an upper and lower Hydra-Matic unit mounted in the special case. The driven member of the fluid coupling is bolted to a planetary gear set which acts as a differential and operates both upper and lower halves of the twin Hydra-Matic. Both upper and lower units are governed to shift independently and alternatively with each other. Both units are geared together at the rear, driving a single output shaft.

In addition, the fluid coupling incorporates a special centrifugal valve arrangement to decrease efficiency of fluid coupling to prevent drive with an idling engine.

From the standpoint of the driver, the main control is achieved through four quadrant positions to cover the gamut of maneuvers. These include: Neutral, Drive, Hold, and Reverse. Since the transmission shifts automatically



Here is the step chart, described in the text. It indicates the progression of automatic gear shifts for the following maneuvers: start in creeper gear and shift to direct; start in low and shift to direct; start in direct.

GEAR RATIOS

7-speed Hydra-Matic		3-speed Reduction Unit	
1st	2.90	Direct	1.00
2nd	2.34	Low	2.00
3rd	1.88	Creeper	3.87
4th	1.45		
5th	1.10		
6th	.89		
7th	.71		
Reverse	3.21		

Total Ratios and Gradeability

Gear Position		Total Reduction	% Grade at Max Engine Torque, 60,000 lb GCW
Hydra-Matic	3-spd. Unit		
1st	Creeper	83.61	24.4
2nd	Creeper	67.46	19.5
3rd	Creeper	53.62	15.2
4th	Creeper	41.75	11.7
5th	Creeper	31.75	8.7
6th	Creeper	25.66	6.8
7th	Creeper	20.47	5.2
1st	Low	43.30	12.1
2nd	Low	34.94	9.6
3rd	Low	27.69	7.4
4th	Low	21.65	5.6
5th	Low	16.44	4.0
6th	Low	13.24	3.0
7th	Low	10.54	2.2
1st	Direct	21.65	5.6
2nd	Direct	17.47	4.3
3rd	Direct	13.84	3.2
4th	Direct	10.83	2.3
5th	Direct	8.22	1.5
6th	Direct	6.62	1.0
7th	Direct	5.27	.6

UPSHIFTS

Reduction Transmission Range

	Creeper		Low		Direct	
Shift	Minimum Throttle	Full Throttle	Minimum Throttle	Full Throttle	Minimum Throttle	Full Throttle
1-2	2.4	3.3	4.6	6.3	9.2	12.6
2-3	3.0	4.1	5.8	8.0	11.5	16.0
3-4	3.5	5.2	6.8	10.0	13.5	20.1
4-5	4.4	6.7	8.5	12.9	17.0	25.8
5-6	6.2	8.8	12.0	17.0	23.9	34.0
6-7	8.0	10.8	15.5	21.0	31.0	42.0
7 to governor	....	13.6	....	26.3	....	52.7

through the seven-speed range, these quadrant positions are the basic control of the Twin Hydra-Matic.

Supplementing the Twin Hydra-Matic is the three-speed reduction unit which has a direct ratio of one-to-one; low position of 2 to 1; and a Creeper or low-low position of 3.87 to 1. These ratios provide the driving ranges to be selected by the operator through manual shift much the same as in the case of the current GMC eight-speed Hydra-Matic drive for lighter vehicles.

As in the case of most automatic drives, the road speed at which the various shifts occur depends upon throttle position. The term "minimum throttle" is the minimum amount of throttle required to upshift or downshift the transmission. "Full throttle" is depressing the accelerator to the floor board. The tabulation given shows the average road speeds at which shifts will occur. This is based on 11.00/20 tires, rear axle ratio of 7.45 to 1, and governed engine speed of 2300 rpm.

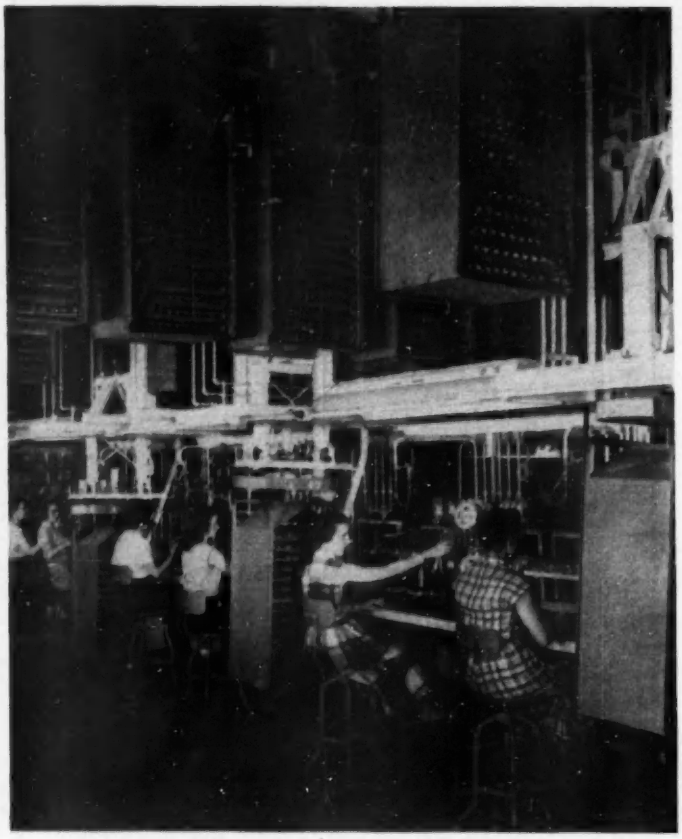
These maneuvers can best be appreciated by studying the stepped chart reproduced here. The three columns to the left show the progression of gear ratio combinations for each of the maneuvers mentioned above; while the three stepped diagrams to the right

(*Turn to page* 122, *please*)

UNIQUE CONVEYOR SYSTEM

Provides Automotion for Instrument Assembly

LONG noted for its pioneering efforts in developing unique manufacturing methods and equipment, AC Spark Plug Div., General Motors Corp., revealed recently that it has a number of outstanding developments incident to the operation of its new instrument plant in Flint. One of these is the distinctive new speedometer released for 1954 production and used as standard equipment on Buick Roadmaster and Super models; the other is a revolutionary installation of a Jervis B. Webb power-and-free conveyor system which introduces complete automation for the entire instrument and instrument panel assembly department. The new AC speedometer, announced some time ago, sets a new styling motif by using a continuous horizontal red line across a rectangular face, discarding the conventional round or semi-circular dial. In the new instrument plant to be described shortly the speedometer is assembled on its own specialized merry-go-round assembly line, strictly for Buick at the present writing.



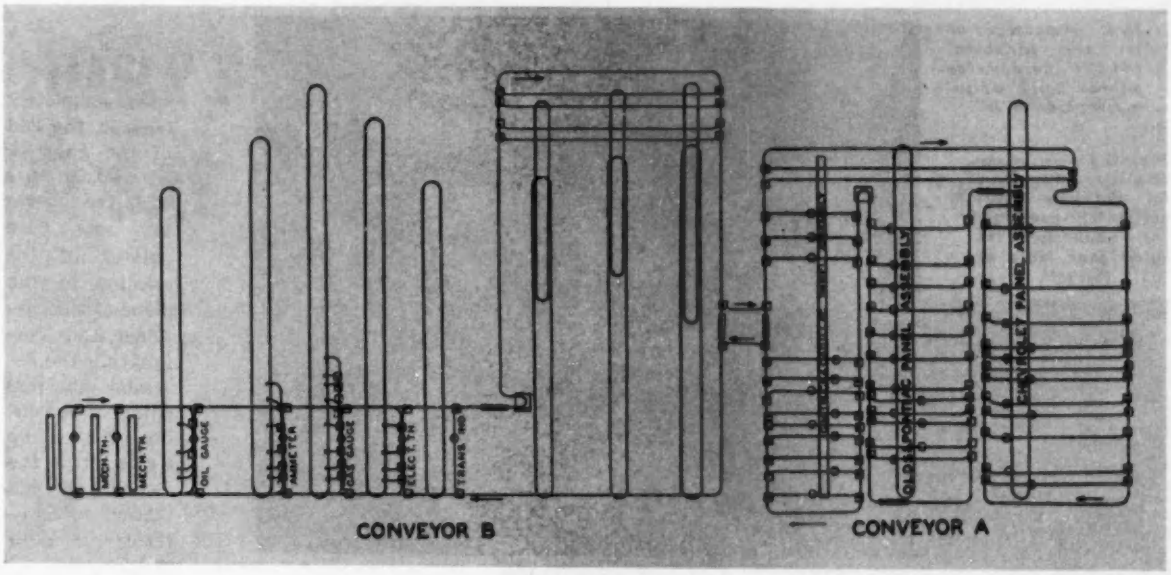
Portion of Chevrolet instrument panel assembly line, showing hangers serving operators at various stations. Overhead are hangers in storage on free rails awaiting scheduling to assembly stations.

A noteworthy feature of the new speedometer is the use of nylon molded parts for the compact gear drive. As a matter of interest the nylon transmission system is illustrated here. At the extreme left is a counter gear having a large spur gear in the center and a small spur gear at its extremity. This cluster is molded of nylon and requires no machining. Meshing with the spur gear is the long nylon shaft which actuates the trip counter. Immediately above the large spur gear element is a worm shaft that drives the gear train from the speedometer head. All of these parts are of molded nylon.

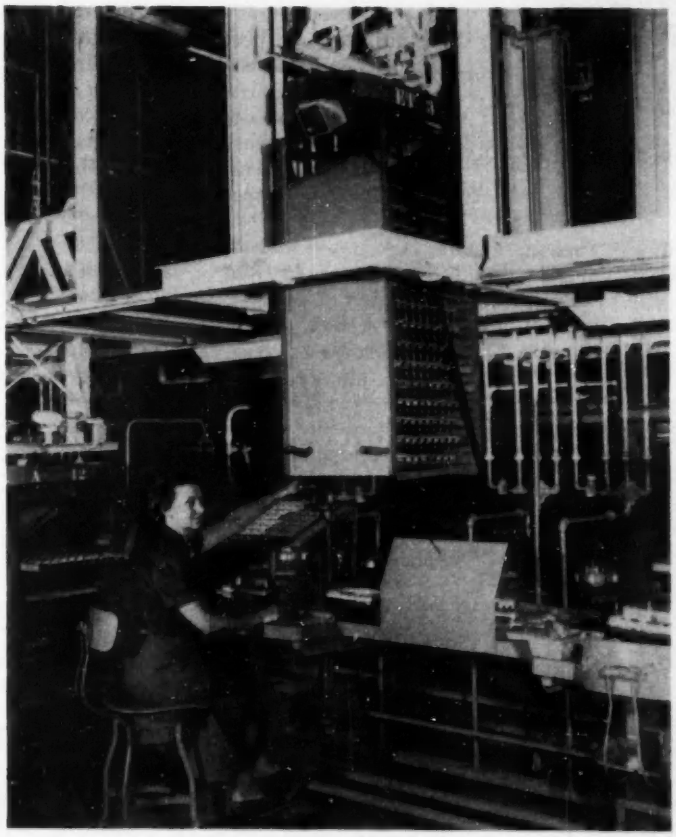
In addition to the obvious production economy in making these parts of nylon, there is the fact that the nylon assembly is quieter, lasts longer, requires no lubrication or attention. According to AC, in recent tests the gear train was run the equivalent of 300,000 miles without apparent wear.

The J. B. Webb power-and-free conveyor system to be described here has some noteworthy management features of general interest. Being fully automatic in operation, it serves to maintain an unfailing supply of parts or sub-assemblies to the assembly lines, thus has a major scheduling function. In addition, it serves as a storage conveyor and in that role it provides a quick visual impression of storage banks of all components. Still another plus advantage is that it assures continuous turnover of parts and immediate consumption of current production. By contrast, the conventional arrangements for storage often permit parts to remain in the bank for days or weeks before they get into the assembly system.

As shown on the layout, the integrated system is composed of two independent conveyors which link



General arrangement of conveyors and assembly lines in the plant.



Here is a view taken on the Oldsmobile panel assembly line. The operator is seen in the act of lowering a hanger from the overhead storage conveyor to her position.

together at two free transfer stations sections. At this point the hangers filled with instruments, coming from the instrument assembly lines, are transferred to the conveyor system that transports them to the proper stations at the various instrument panel assembly lines. In the same manner, empty carriers from the panel assembly system are transferred to the other conveyor for return to their respective instrument assembly lines.

The larger area at the left on the layout encompasses the group of eight carrousel type mechanized power conveyor assembly lines for the variety of instruments required in current production, includes three smaller assembly lines at the extreme left. The "B" conveyor, serving this area, has 620 ft of power rail, 380 ft of free rail. It is provided with 11 drop stations—indicated by a hex—the carriers being loaded with instruments at the inspection station at the end of each line.

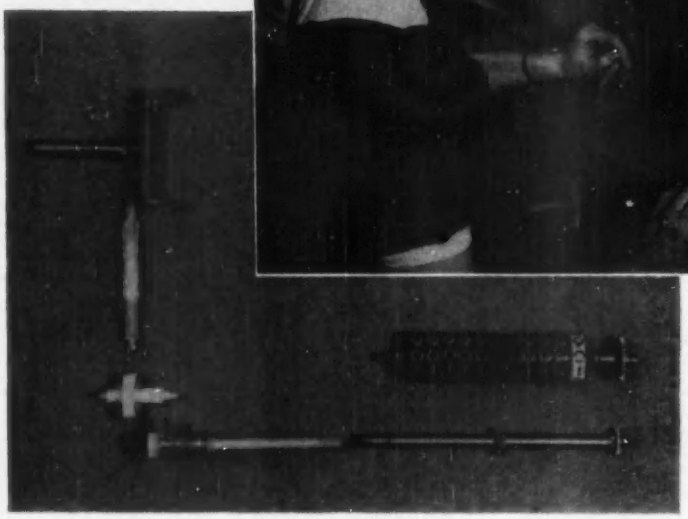
The panel assembly area at the right contains the carrousel assembly conveyors on which are produced panels for GMC, Cadillac, Pontiac, Oldsmobile, and Chevrolet. Loaded carriers from the instrument assembly section move to this area, are transferred to the "A" system conveyor, then are distributed automatically to the proper station along each of the panel assembly lines. This area contains 36 drop stations, has 700 ft of power rail, 1200 ft of free rail.

The entire conveyor system has a design capacity of 334 hangers or carriers with 218 in use at the present time. They have seven different types of hangers to handle the various components. The longest transfer time is approximately 40 minutes, shortest transfer time about four minutes.

Briefly this is how the system operates. In the first

Final inspection of the new horizontal red line speedometer on the Buick instrument line at AC.

Exploded view of the odometer gear train for the new Buick horizontal speedometer, emphasizes the nylon gear train at the left.

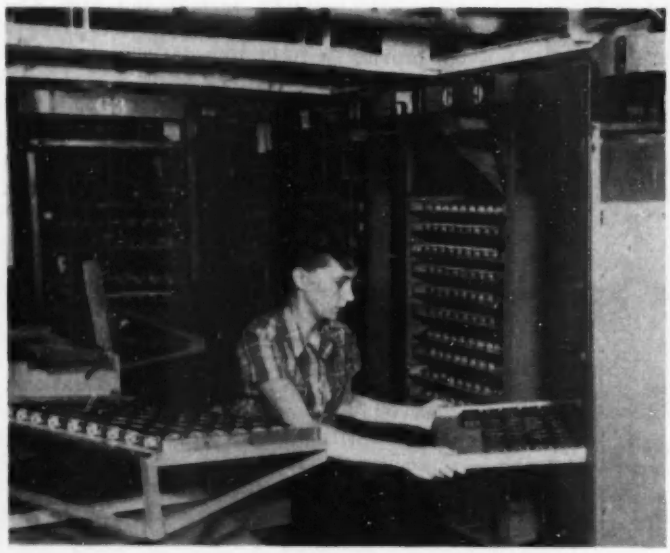


place, each hanger is provided with a selector switch having a multiplicity of schedule points, any one of which can be selected by an operator, depending upon the destination of a specific hanger. When a carrier has been completely filled at the end of the gage or speedometer line, the operator sets the pointer of the selector to the name of the customer, thus designating the assembly line and point of assembly. Then he actuates the switch at his station to move the carrier up to the outgoing position. The carrier moves up to the power-and-free conveyor, is picked up automatically, and proceeds to its destination. The selector switch takes over to select the proper course.

Eventually, these carriers switch over to the second system which transports them about the panel assembly area. Here they enter their respective storage free lines, according to the selector setting. Each storage line is so sloped that the carriers will roll by gravity to the top-feeders in front of drop stations.

Each assembly station at each of the panel assembly lines has a drop station, serving the function of lowering a carrier from the overhead line or elevating an empty carrier to feed back into the system. This drop is actuated by an air valve, controlled by the individual operator. In addition to raising or lowering the carrier, the air valve has an intermediate position, permitting the carrier to be adjusted to any required height. This facilitates the progressive unloading of carriers, tray by tray, keeping the trays constantly at work level. When the carrier has been completely unloaded, the operator sets the pointer on empty, moves the air valve to raise the carrier. This moves the carrier to the overhead line where it will complete its cycle by returning to the instrument assembly lines at the left.

This action clears the way for another loaded carrier to move into the drop station ready for lowering at the operator's signal. The empty carriers automatically transfer back to the conveyor system at the left and enter their respective storage free lines, ready to move down to the instrument assembly station when the operator clears a full carrier.



This view, taken on the Pontiac gas gage assembly line, shows the loading of trays at an inspector's station and placement of filled trays on the hanger. When the hanger is fully loaded it is directed to the overhead conveyor line for movement to panel assembly area.

TIMELY PROBLEMS DISCUSSED At SAE Meeting

By P[redacted]ennedy

Design, Production and Finishing Among Subjects at the Society's National Passenger Car, Body, and Materials Meeting

HIGHLIGHTING some always interesting subjects—cutting production costs and solving new engineering problems—were symposiums at the SAE National Passenger Car, Body, and Materials Meeting in Detroit last month. Leading topics included wear in overhead valve V-8 engines, new forming methods, car shake and stability. Informative sessions also were devoted to latest body finishing and painting developments.

A critical comparison of British and U. S. passenger cars was developed by Laurence Pomeroy of *The Motor*, London. After a comprehensive statistical review of European passenger cars and the industry which builds them, he pointed out that drag reduction is of prime importance. High cruising speeds are possible in most countries except England. The U. S. passenger car, capable of 85 mph on about three hp per sq ft of frontal area, compares with the European average of about 70 mph on 1.77 hp per sq ft, according to Mr. Pomeroy. He believes many have a misconception of certain characteristics of European cars. An arbitrary weight per cu ft (frontal area times wheelbase) of potential cars averages about the same as that of a typical American car—10.8 lb against 11.2 lb for the Chevrolet. Overhang of the Chevrolet—72 per cent more than the wheelbase—compares with an average of 68 per cent for European cars. Unused length, width, and height were shown to average respectively three, five, and six in. less than for the American car. Principal interior dimensional difference length-wise was shown as rear leg room, over six in. less in European cars. Seat width averages seven in. less, but overall car width is 12 in. less.

British engine design details were shown by C. L. Goodacre of Clifford Motor Components, Ltd. He included some interesting sidelines on design criteria and production problems.

With overhead-valve V-8 engines becoming the accepted standard, it is easy to see why the symposium on cam and tappet wear problems was popular. The three papers all represented results of road tests plus various other tests. There was general agreement that wear and scuffing require a different lubrication solution than does spalling. Hardenable iron for valve lifters, it was agreed, would ease the lubrication problem since this material does not spall. The paper by H. A. Ambrose and J. E. Taylor of Gulf Research and Development Corp., indicated that low viscosity oils may permit greater wear with certain materials, and that antiwear additives can cause spalling of chilled iron lifters.

Seven combinations of metals and surface treatments for cams and tappets in addition to differences in mechanical features are used on eight American overhead-valve, V-8 engines. T. W. Havely, C. A. Phalen, and D. G. Bunnell, of Shell Oil Co., evaluated about 100 different lubricants; and from the data presented, concluded that a formulation suitable for one metal combination may very well be completely unsatisfactory with another. Work at General Motors Corp., summarized in the paper by J. B. Bidwell and Paul Vermaire, indicates the influence of lubricating oil upon fatigue and wear of engine parts. Particular additives have been shown to lack boundary lubricant properties and promote lifter pitting.

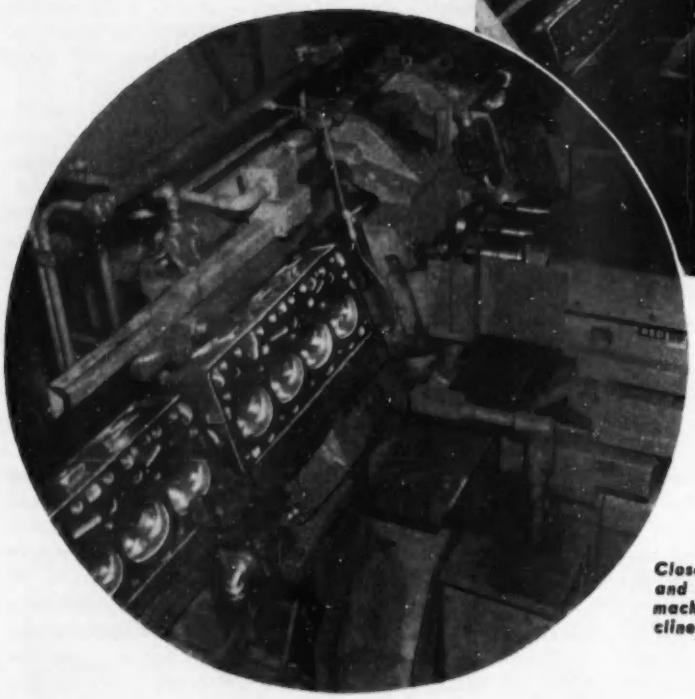
Several new possibilities for hot and cold forging of automotive parts were suggested in a motion picture shown by R. G. Friedman, of the National Machinery Co. He opened the symposium on the influence of new forming methods on design. Taking the wraps off the Koldflo process for extruding objects other than artillery shells, D. I. Brown, of Mullins Manufacturing Corp., showed several before-and-after examples of cylinders, formerly made from as many as six pieces, reduced to half as many parts made by this process. The paper by S. O. Evans, of Babcock and Wilcox Co., discussed an extrusion process using a glass lubricant. Die tooling do's and don'ts, from the viewpoint of the lubrication supplier, were pointed out in the paper by J. F. Leland and J. W. Helms, Parker Rust Proof Co. (AUTOMOTIVE INDUSTRIES will present a more complete roundup of new forming methods in an early issue.)

The latest methods of automobile painting and finishing were discussed by a panel which covered means of testing automotive finishes, compared enamels and lacquers, numerated processes and equipment now in use, and suggested what to look for in the future. Roy B. Davis, of du Pont, indicated the outlook was good for improved chip resistance and gloss retention. He said the water borne latex paints are unsuitable at

(*Turn to page* 100, *please*)

THIS is the First of a Series Dealing With Machining Operations on Components of the New Mercury Engine. Succeeding Articles Will Describe Production of Manifolds and Cylinder Blocks

Overall view of the Heald 17-station transfer machine which semi-finishes and finishes valve guide holes, valve seats, valve throats, and cylinder head valve faces.



Close-up of the automation mechanism and tooling used in the Heald transfer machine. Note how the heads are inclined so that the valve ports are in line with the cutting tools.

NEW machine tools as well as other related tooling and equipment have been installed over a large portion of the Ford Cleveland Engine Plant for the production of the new 161-hp, OHV V-8 Mercury engine. Basic design changes between the old and the new engines are primarily in the heads, block, and manifolding—for full design details see AUTOMOTIVE INDUSTRIES, Dec. 15, 1953. This article deals with the machining operations in the manufacture of the head.

To insure high production and quality manufacture, the engine line has been completely automated and utilizes numerous devices for checking and inspecting the various engine parts machined at Cleveland.

Many of the machine tools incorporate stations having automatic checking fixtures to control product quality as the part is being produced. Also, there are numerous inspection stations, supplied with the latest equipment, that have been established along the production line.

Another feature is the use of Cross tool boards which are located at strategic machine operations. Sharp, pre-set tooling is readily available in the event of machine shut-down due to tool wear.

For good housekeeping and to prevent damage to machinery by chips piling up, chip conveyors are used extensively throughout the entire block production line. Coolant filters are also utilized in the system.

One of the features of the plant layout is that finished parts go right into the assembly line by conveyor from the machine line. There is no intermediate stockpiling of the engine parts manufactured at Cleveland.

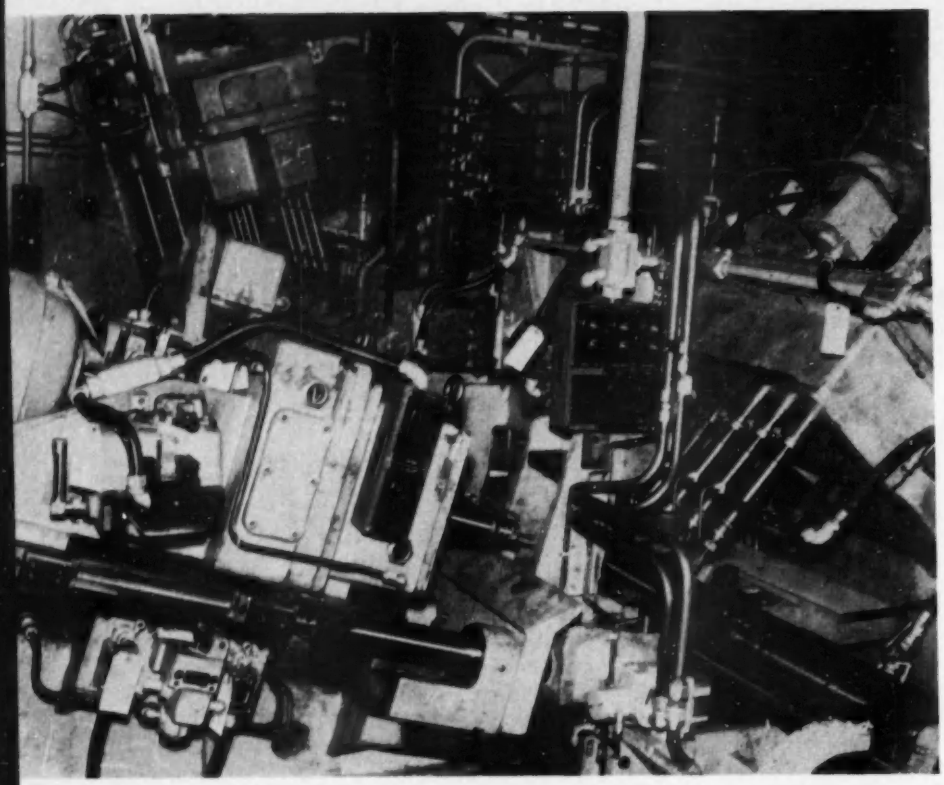
Latest Tooling for Making Mercury Engine Cylinder Heads

By Thomas Mac New

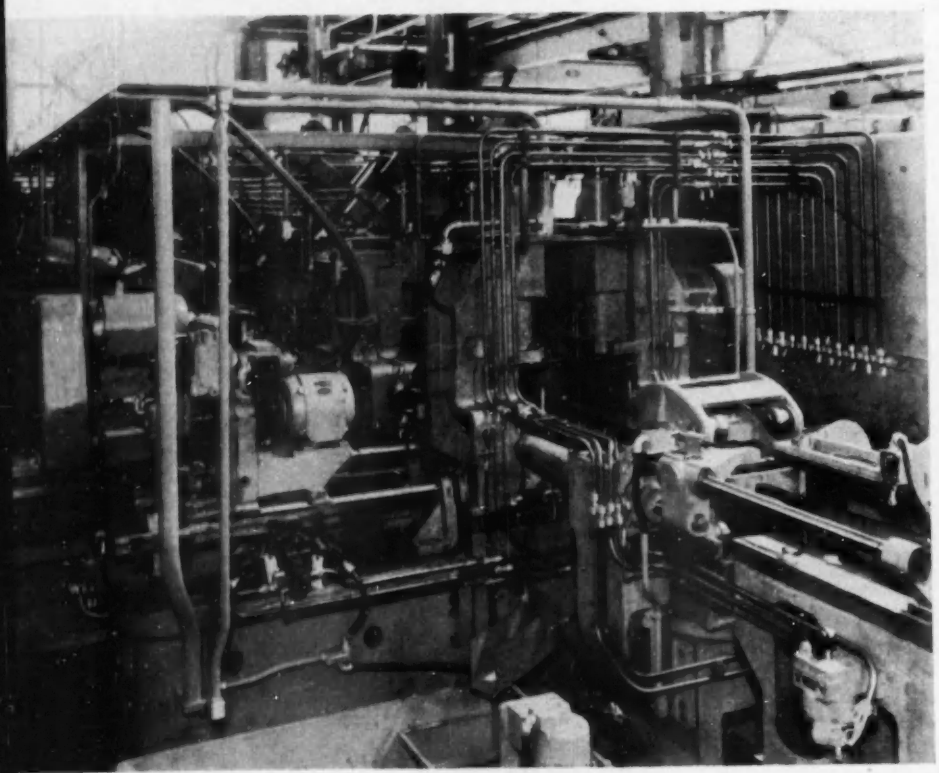
Getting into the actual production setup, Mercury is utilizing three machine lines—two lines for broaching—for the manufacture of the new heads. Cincinnati two-way horizontal broaching machines are used for the first operation on the heads. Location of the workpiece in the huge machine is by means of the two end combustion chambers; the work is clamped hydraulically on the sides and end pads. Including load and unload, each machine has a total of six stations. All carbide tooling is used in the broach holders.

During the first operation, the head is rough and finished broached on the rocker arm pads, intake and exhaust manifold faces, and eight locating pads. The head is then automated to the next station which rotates it 180 deg so that the combustion chamber joint face is up and the intake face is to the right hand side. Automatically, the head enters the next machining station where the combustion chamber joint face is rough and semi-finished broached and four pads on the plug side are finish broached. At the next station in the machine, indicator gages are used to check the parallelism and depth of the combustion chambers in relation to the joint face. Another indicator gage checks for height and parallelism of the joint face and the relation of the locating rails to the construction pads. A third gage checks for the height of all bosses, pads and locating rails from rough locating spots. The head is then unloaded and auto-

Footburt 19-station, 115-spindle drilling and milling machine. Heads are located in the fixtures from the two end combustion chamber sides and from the bottom of four locating pads.



The stations of the W. F. & John Barnes 27-station transfer machine pictured here are used to tap spark plug holes, counterbore spark plug clearance holes, countersink, and chamfer intake face holes.



In this view of the W. F. and John Barnes 27-station transfer machine, the final work stations are shown.

mated to the next operation.

Prior to the actual machining, the automation device turns the cylinder head 180 deg in a horizontal plane. The workpiece is then loaded into a 19 station Footburt, 115 spindle, fixed center hydraulic drilling transfer machine. In this unit the end pads of the head are milled, bolt and push rod holes are drilled and spot faced, rocker arm bracket holes are drilled and countersunk, an oil hole is drilled, intake and exhaust valve seats, faces and throats are rough machined, valve guide holes are drilled part way, and oil return holes are drilled. The head is located in the fixture from the two end combustion chamber sides and from the bottom of four locating pads.

A special Heald 17-station transfer machine is brought to play for the next operation on the head. Three of these machines are used with two of them working on the passenger car engine heads and one on the commercial engine heads. With the head located from two reamed locating holes, the machine semi-finishes and finishes valve guide holes, valve seats, valve throats, cylinder head and valve faces. Specifically, the valve guide holes are drilled, reamed, and bored, valve seats and throats are generated.

After the workpiece is automatically unloaded from the Heald machine, it receives a 100 per cent inspection of the valve seats and guide holes for runout. Inspection is carried out by a Sheffield

column-type Precisionaire equipped with air spindles for checking the concentricity between the valve seat and the valve guide on both intake and exhaust valving. Valve guide hole sizes are identified by spots of color—red, 0.3430 to 0.3435 in.; green, 0.3435 to 0.3440 in.

With the combustion chamber joint face down and with the intake face to the right hand side, the cylinder head is loaded into a 27-station W. F. & John Barnes transfer type machine. During this phase of machining, the intake and exhaust faces, spark plug holes, rocker arm bracket holes, and end holes are drilled, counterbored, countersunk, reamed, and tapped. A flush type lubricating setup is utilized for all tapping operations. During the course of machining, the head is automatically inspected, indexed, rotated, blown out for chip removal, and finally goes through a stationary brush which cleans the locating spots.

If during the operation it becomes necessary to remove a broken tap from a head, an Elox electron radial drill is used for the operation. This machine is of the electrical discharge type and disintegrates the tap without damage to the work piece.

At this point in the manufacture of the cylinder heads, the machine line narrows down from three to two lines. Lapointe broaches, of the tunnel type, finish the combustion chamber joint face. The head is located from eight formerly broached spots. For the finish broach operation, 13 tungsten carbide blades are used in the machine. When the head leaves the broach, it is automated to a vibratory mechanism for the removal of chips accumulated during broaching.

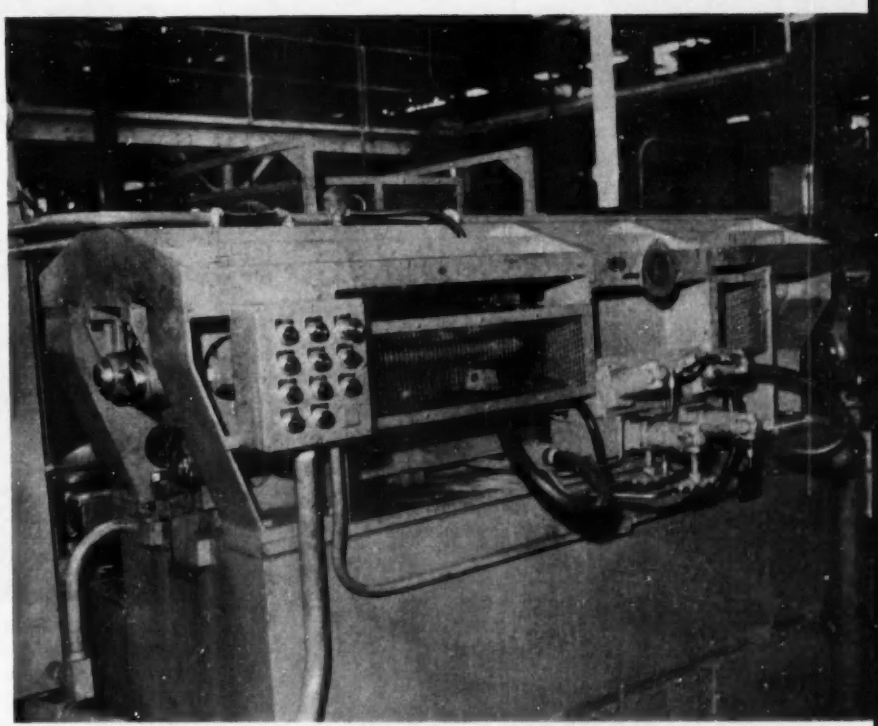
Now widening out again to three production lines, the next steps involve putting the finishing touches to the cylinder head. These consist of flushing, cleaning, putting in Welch plugs, and inspection. Automation is used to convey the workpiece throughout the various work stations. As the head moves into a Lee flush-out machine, it is automatically indexed and clamped as the hose lines move into position. After the water jackets are flushed under pressure, the head is ejected to a Wilson automation device which rotates it 198 deg in a vertical plane.

Continuing along the automated line, the head is loaded automatically into a Solventol industrial washer. The head proceeds through the washer with its intake port face leading and the combustion chamber joint face upright. Upon leaving the cleansing portion of the line, it proceeds to a four-station transfer type machine, made by the Expert Welding Machine Co., for the insertion of the Welch plugs. One of these plugs is used in each end of the cylinder head. Prior to the actual insertion, the plug holes are automatically greased. Modern Industrial equipment is used at the next operation on the line. These machines are of the three-station transfer type and are used to air test the head for possible leaks. The head is located by the two milled end bosses. This is the first major test prior to full inspection, so any heads not passing are rejected before the final inspection stations.

As the head moves over a slat type conveyor, a multitude of inspection and checking devices establish the product quality. Indicator, bluing, master, thread, feeler, and other gages are used along with Sheffield column-type Precisionaires. The Sheffield equipment is used to check the concentricity between valve seat and valve stem and for straightness of valve stem holes.

From this point, the cylinder heads move along the slat type conveyor to the first assembly operation.

Among the other tests are parallelism and depth of combustion chamber, joint face, squareness of spark plug counterbore with thread, intake and exhaust valve seat angle, throat diameter below intake and exhaust valve seat, and location of combustion chambers and relation of all holes in face to manufacturing holes.

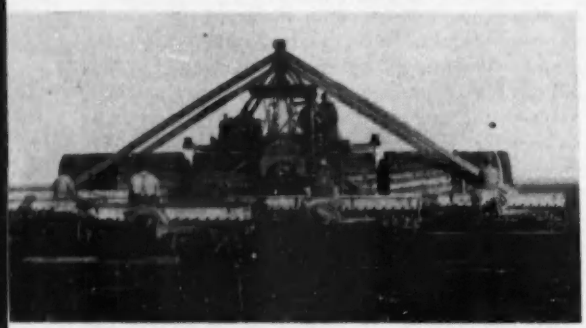


After all of the machining operations, cylinder head water jackets are flushed out under pressure in this Lee machine. The work is automated in and out of the unit and the entire machine cycle is automatic.

..50 Years.. of Track Type TRACTORS

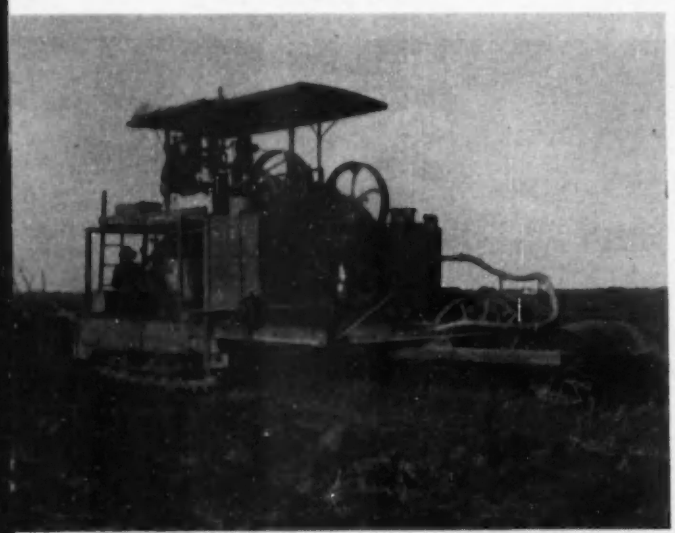
1889

Steam powered tractor built by Best Manufacturing Co. in 1894. The company started production of steam traction engines in 1889.

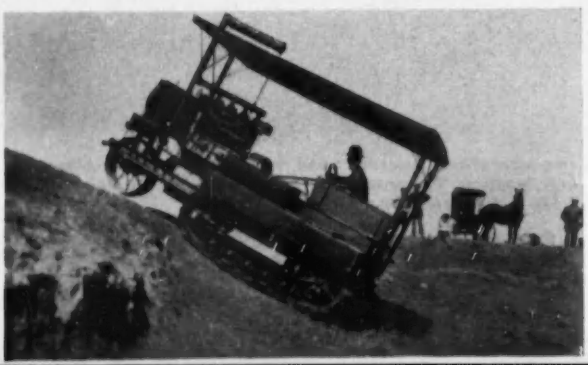


This special steam powered unit was built by the Holt Manufacturing Co. for use on soft soil. Overall width was nearly 46 ft.

1904



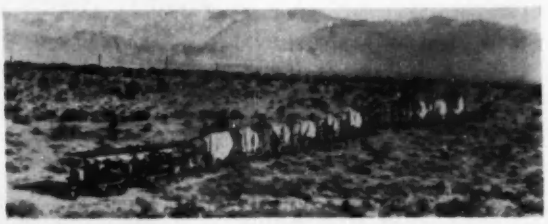
First practical track-type tractor undergoing tests on November 24, 1904. It consisted of a Holt steam traction engine with a rough set of tracks replacing the wheels.



THIS year marks the 50th anniversary of the first commercially successful track-type tractor. It was in 1904 that the Holt Manufacturing Co. tested the first practical crawler in California.

The conception of the crawler came about as the result of a need for a unit with compact power that would ride

1909



Caterpillar 45 tractors were used to pull wagon trains across the Mojave Desert during construction of the Los Angeles aqueduct in 1909.

WWI

Thousands of crawlers were used during World War I. The Caterpillar 75 shown here is pulling a large howitzer.

1906

Holt Manufacturing Co. built the first gasoline engine powered crawler in 1906. Here is the second Caterpillar gasoline tractor as it was being tested.

Best 60-hp tractor pulling a Killifer subsoiler near Ignacio, Colorado, in the early 1920s.

1920

high on the soft delta lands of California around the turn of the century.

Both Benjamin Holt, president of the Holt Manufacturing Co., and Daniel Best, president of Best Manufacturing Co., had been making steam traction engines since about 1890. They attacked the soft soil problem by adding larger and larger wheels to increase the bearing areas of their machines. These machines provided the necessary power and rode well up on the soft earth, but were extremely awkward to maneuver and practically impossible to transport.

In his quest for a more compact unit that wouldn't mire down so easily, Holt removed the wheels from one of the steam models his company was making and substituted a pair of rough tracks. The result was the first practical track-type tractor which was tested on November 24, 1904, near Stockton, Calif. It was about this same time that the Holt Co. originated the trademark "Caterpillar" and soon applied it to many products in the Holt line.

In 1906 Holt was the first to put a gasoline engine in a crawler, and in 1913 was one of the first to come out with an all-track model which eliminated the tiller wheel in the front.

In 1908 Holt bought the Best Manufacturing Co. from Daniel Best. However, in 1910 C. L. Best, son of Daniel, organized the C. L. Best Gas Traction Co. in Elmhurst, Calif., to manufacture gasoline driven wheel-type tractors. In 1913 Best came out with his first track-type tractor, the Best 75-hp Tracklayer, and competition between the Best and Holt interests continued until the two companies merged in 1925 to

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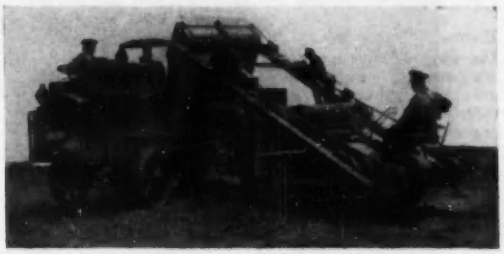
1924

Caterpillar 10-ton tractor with early model bulldozer in use during construction of Soldier Field, Chicago in 1924.

1926



Best 30 gasoline engine powered tractor with front end shovel loads a truck for the Marine Corps in 1926.

1931

The first Diesel-powered tractor was introduced by Caterpillar in 1931. The original Caterpillar Diesel track-type tractor, shown here, is still in operation.

W W II

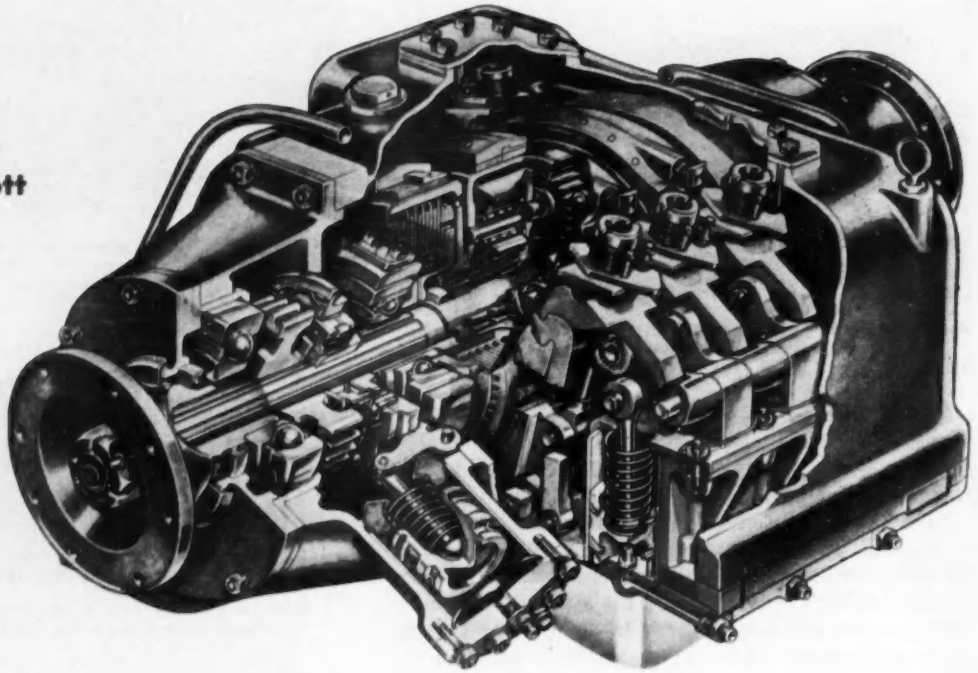
Caterpillar D4 tractor, with bulldozer blade high and operator protected by armor plate, operates along with infantry during WW II.

1954

In its 50th year, the track-type tractor is bigger and better than ever. This tractor is a Caterpillar D8 model.

By

David Scott



Cutaway view of the Leyland pneumo-cyclic transmission showing self-compensating mechanism for brake band wear, arrangement of planetary gear sets, etc.

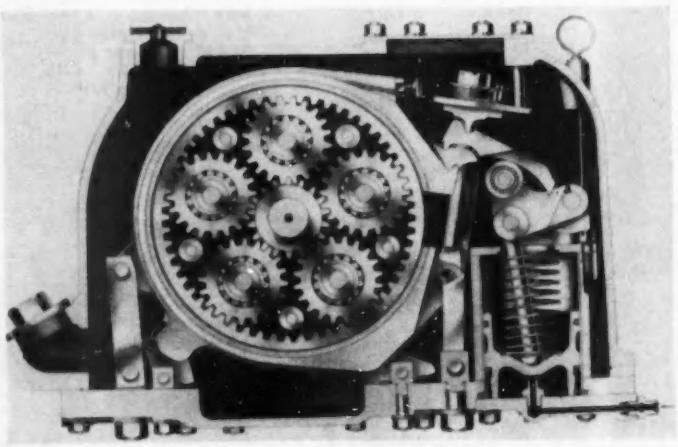
Air Actuated Transmission Has Automatic Brake Band Adjustment

LONDON, ENGLAND

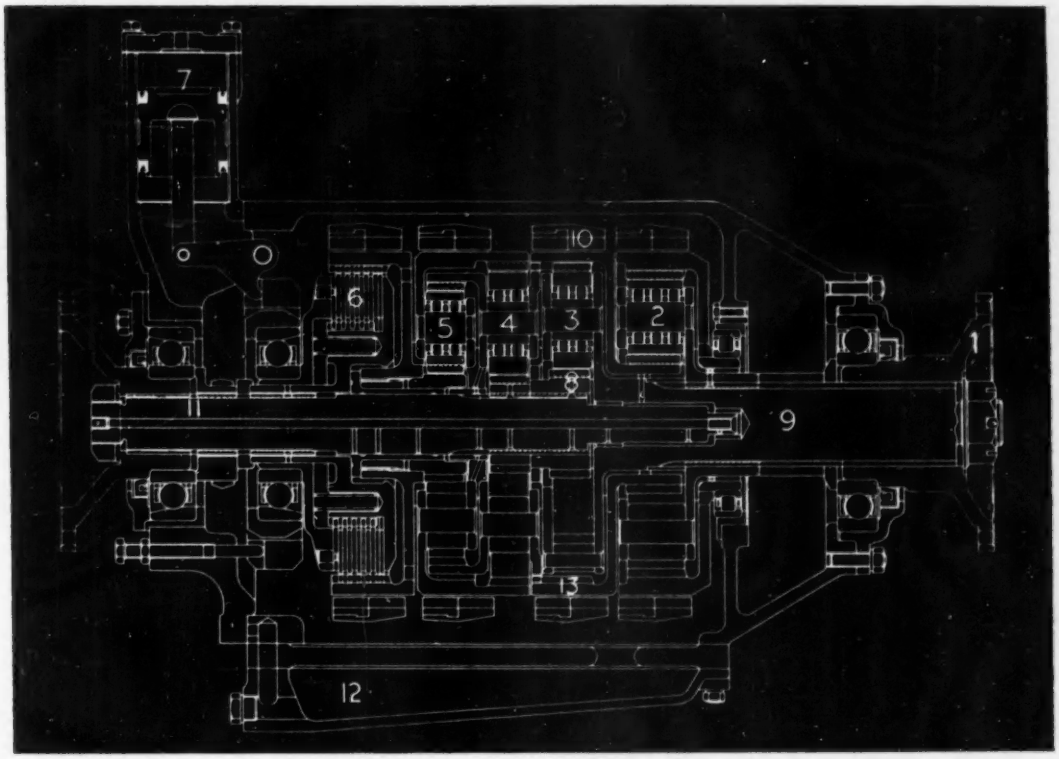
SELF-ADJUSTING brake bands to compensate for wear are among the features of a new pneumo-cyclic gearbox developed jointly under Leyland and Wilson patents by Self-Changing Gears Ltd. and Leyland Motors Ltd., which is now manufacturing it. Pressure from each air cylinder is applied to its respective brake band through an arm and roller to the cam face of an operating lever whose fulcrum pivots on the adjuster mechanism. This consists of a knife edge and adjuster plate retained by a cylindrical nut on the pull-rod linked to the lower end of the brake band. The nut is wrapped by a spring which locks it.

Since brake tension is determined by the height of the operating lever, as the lining wears the lever will be allowed to move higher. At the same time, the knife edge and adjuster plate will swing further forward.

Beyond a certain degree of lining wear, the increased forward movement of the pull-rod causes the angular edge of the adjuster plate to strike a fixed beveled stop when the brake is applied. The adjuster plate is thus deflected slightly counter-clockwise, loosening the spring around the cylindrical nut. But when pressure on the operating lever is released the



Transverse sectional view of a planetary gear set, brake band operating mechanism, and air cylinder.



Longitudinal section of the new transmission. 1-Output coupling. 2-Reverse gear train. 3-First gear train. 4-Second gear train. 5-Third gear train. 6-Direct drive clutch. 7-Direct drive cylinder. 8-Sun gear of first gear train. 9-Output shaft. 10-Brake band. 11-Input shaft. 12-Oil pan. 13-First gear annulus.

spring tightens around the nut, retaining the plate in its deflected position. The pull-rod then swings back and the cam-shaped tail of the adjuster plate is counter-rotated in a clockwise direction by a vertical pin fixed to the gearbox housing.

The adjuster nut rotates with the plate and this centering operation causes it to be screwed down by the correct amount. In this way the effective length of the pull-rod is shortened, thus compensating for brake wear.

The gearbox employs four epicyclic gear trains with a multi-plate clutch for direct drive in top gear. Ratios are 1, 1.59, 2.43, 4.28; reverse is 5.97 to 1. Air cylinders for the gears are easily accessible by removing a cover plate on the under side of the transmission housing.

The large cylinder for the multi-plate clutch is mounted externally, being cast integrally with the front cover which also houses the gear-type oil pump. Restrictor valves intended to control the rate of air flow and insure continuity of drive are incorporated in the inlets to the four small cylinders.

Control is by a gate-change, trunnion-mounted operating lever. Safety devices to avoid accidental shifting to reverse and to lock the lever in neutral when desired are included.

This semi-automatic transmission is intended for use with a fluid flywheel or centrifugal clutch. Its use in Leyland buses and coaches this year is expected. Advantages claimed are smoother and more rapid gear changes and acceleration, clutch-free operation for the driver, simplicity of maintenance, and adaptability to underfloor mounting. At present, the London transport system requires pre-selection gearboxes on all its passenger vehicles.

Industry Standard for Truck Muffler Design Established by AMA

ADOPTION of an industry standard for muffler design has been recommended to all truck makers by the Automobile Manufacturers Association. The standard, which would apply to both original equipment and subsequent replacement units, would establish a maximum permissible noise level and an agreed method of measuring exhaust noises.

The action originated with the AMA's Motor Truck Committee, acting on the advice of its Truck Noise Subcommittee.

Recommended measuring procedure, using the Beranek-Armour Equivalent Tone Method, was developed by the Armour Research Foundation last year at Illinois Institute of Technology, under terms of a grant from the American Trucking Associations.

A major advantage accruing from the method

(*Turn to page* 98, *please*)

THIS Is the Third in a Series of Articles Devoted to the Automotive Parts Industries. Part IV Will Appear in an Early Issue.

By Joseph Geschelin

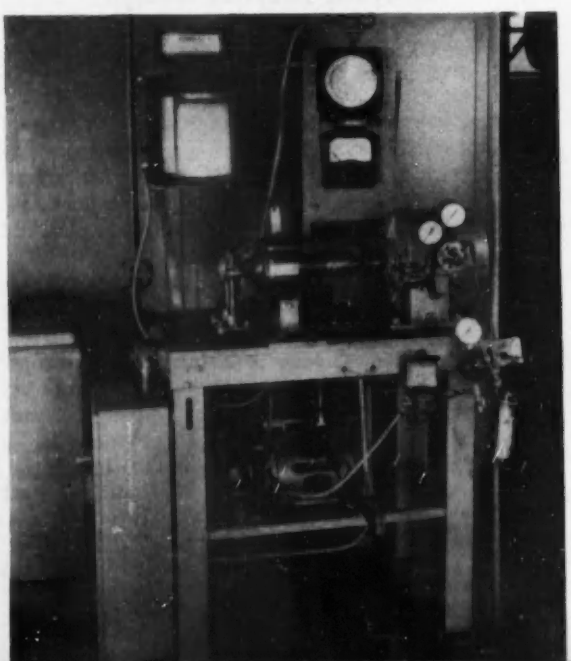
PART III

Trouble Shooting by PARTS MAKERS Aids Industry in PRODUCT DEVELOPMENT

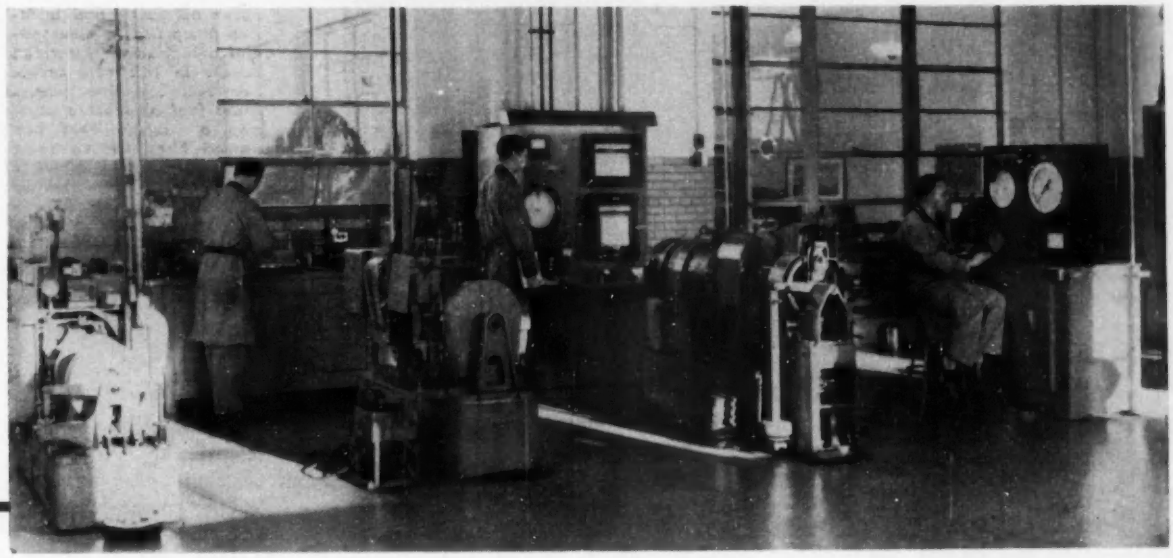
BESIDES its well known role in the development of parts and accessories for automotive vehicles and equipment, the great family of parts makers also provides special services of more than passing value to the engineering group. We refer particularly to trouble-shooting. In its broad sense, trouble-shooting is not just a matter of correcting things that may be wrong with an experimental setup of production items. Its greatest value lies in the ability of the outside specialists to adapt an existing design or to find simple, low cost modifications that will suit the special requirements of a new engine or some other element of the vehicle.

To be more specific, consider a related group of specialists who make parts for engines. Each of these specialists, assuming he is a leader in his field, has

This is a small dry band brake dynamometer used by Raybestos-Manhattan. It is a specialized piece of equipment designed around a band brake assembly with controls to simulate constant drag, and intermittent application with constant output torque control.



KV meter, at the right, aids laboratory studies of ignition equipment at American Bosch. It has a range of 0 to 50,000 volts, is portable, and can be operated from any 110-volt AC outlet. The unit at the left is a laboratory drive stand with a speed range of 25 to 4500 rpm and mounts a magneto.



A view in the American Brakeblok laboratory at Mahwah, N. J., showing a group of new friction testing machines which evaluate the newly developed friction formulas for performance, fade characteristics, wear rate, and stability.

Close-up of the instrumentation mounted on a test truck operated by American Brakeblok in its road testing program. Temperature readings from all four wheels are recorded simultaneously from thermocouples mounted on the braking surface of each drum. These data are transmitted to the recording instruments through the hub of each wheel by means of a rotary switch. A motor-generator supplies auxiliary power for operation of the various instruments.

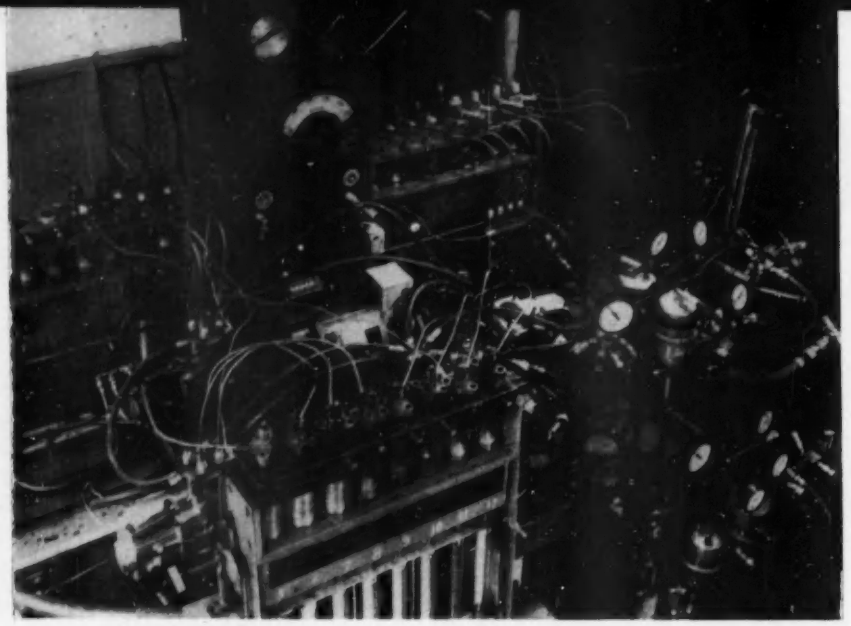
an opportunity to supply a large number of customers. Consequently, he deals with a large cross-section of engine builders and has had ample experience in studying the characteristics as well as the idiosyncracies of a variety of different kinds of engines.

Obviously, where there is a special problem of carburetion or piston ring setup, or air cleaner and silencer combinations, these specialists can provide a prompt and effective prescription for a new engine whether it be on the test block or on the proving ground.

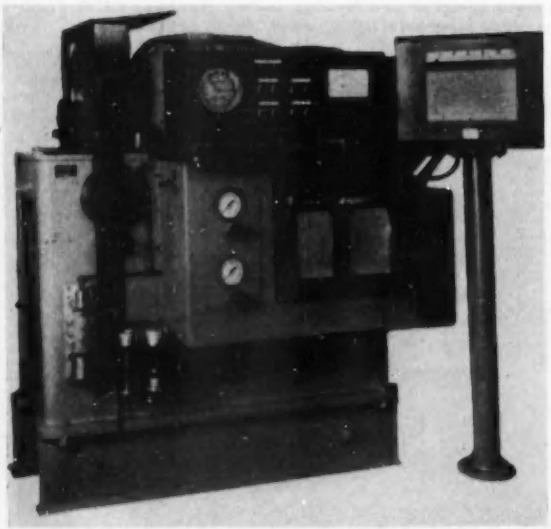
The present article is a part of the continuing series on the activity of parts makers in their various fields of specialization. This installment, covering the activities of a group of four leaders in their field, lends emphasis to the amazing amount of research work being done in materials as well as product development, and highlights important facilities devoted to these efforts.

Raybestos-Manhattan, Inc.—Latest news from this company is the realignment and coordination of research and development facilities at its seven plants to better meet immediate and long range requirements. At the present time the principal automotive products cover the following variety of items: brake blocks and brake linings, clutch facings and transmission friction elements—made in molded, woven, semi-metallic, or sintered metals; V-belts; hose for hydraulic oils, air, and water; molded rubber and silicone hydraulic brake parts, diaphragms, seals; packings and gaskets; engineered Teflon, Nylon, and other molded plastics; asbestos cloths, rovings, and tape.

Because of the diversity of products and materials involved in the operation of the various plants, space does not permit even a sampling of all of the projected plans. Suffice it to say that the overall program calls for better integration of the potential inherent in the engineering talent now working in the fields of chemical, physical, and materials applications research. The practical goal is to develop a workable relation be-

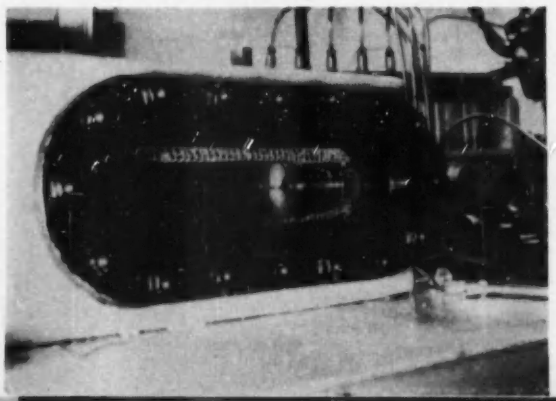


Filter efficiency and injection pump life receive special attention at American Bosch. In this test setup, five fuel injection pumps draw fuel oil from a common oil supply that has passed through various types of filters. Fuel oil is deliberately contaminated with Arizona dust before filtering. This test provides a means of correlating filter efficiency with rate of injection pump wear.



Improved version of the Chase dyamometer developed by Raybestos-Manhattan for testing pieces of friction material to determine coefficient of friction, ability to withstand heat and measure of rate of wear. R-M's contribution to this well known machine was to provide a system of constant output torque in addition to the conventional dead weight loading. This is said to increase both the scope and accuracy in testing friction materials.

American Bosch employs this pressure chamber, in which the compression pressures encountered in Diesel engines are simulated for studies of spray from fuel injection nozzles. The equipment will withstand pressures up to 1000 psi, nitrogen being used to achieve the pressures and densities desired.



tween the empirical and scientific approach in the solution of problems leading to greater products superiority.

Some specific objectives at the present writing may be summarized as follows: (1) Scientific investigation of certain phenomena associated with undesirable brake lining behavior under adverse service conditions. (2) Study and development of improved organic binders for friction materials to meet the demand for better stability in all phases of deceleration. This program has been expanded to include ceramics and cerametallics as well. (3) The basic investigation of the physical aspects of asbestos of various origins for classification and final selection for best end use. Included in this study are the host of allied materials employed as a component part of the friction material. Up to now the use of many of these ingredients has been based upon empirical knowledge. For the future, the company intends to undertake scientific studies that should uncover positive or negative characteristics in friction products, thus making for a more straight-forward approach to product improvement.

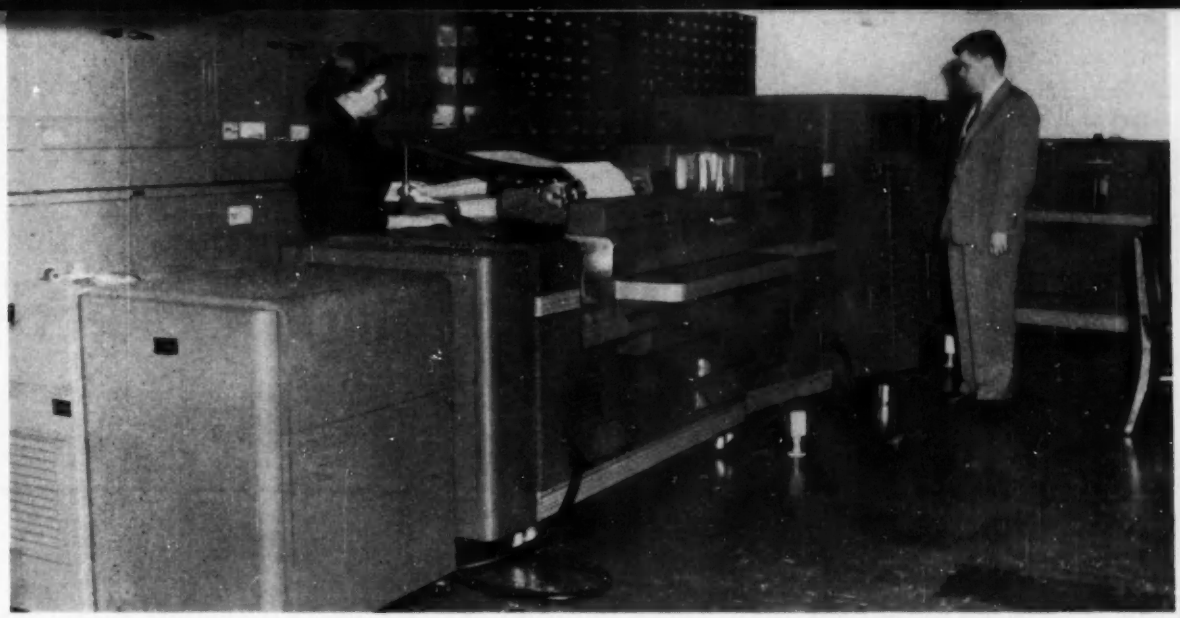
Development plans also have been expanded to meet the wider applications of sintered metal friction products. Plans for product improvement and further development of automatic transmission bands and disks have been projected to keep pace with the rapidly expanding art.

Facilities also have been expanded for the study of engineered plastics such as Teflon, nylon, silicone, and other hot and cold molded materials for functional, electrical, and electronic applications. This includes packings and gaskets intended for still greater resistance to heat and corrosion.

Some selected pieces of special equipment in the laboratories are reproduced here. In addition, attention is drawn to the enormous and versatile inertia brake-testing dynamometer, installed a few years ago, and described in AI, August 15, 1950.

Thompson Products, Inc.—This organization started in the automotive industries in 1904 by making the first welded valves.

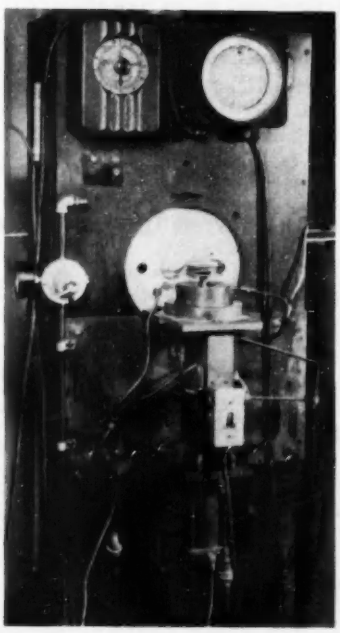
An early and significant contribution was the development of better valve steels. Thompson silicrome,

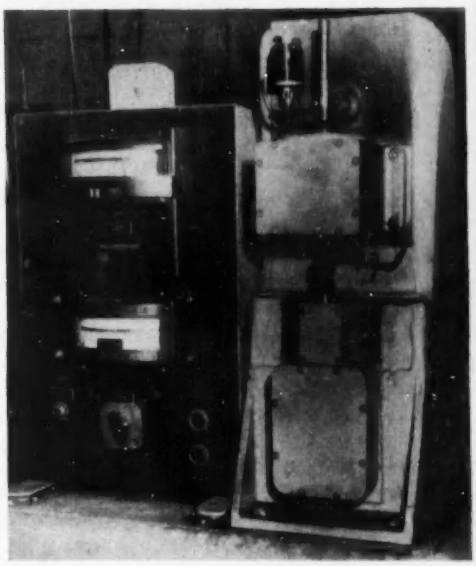


Here is the special electronic calculating machine used by Thompson Products engineers and research men in the solution of intricate mathematical problems. An example of the type of problem which can be solved is the Polydyne method of cam design advanced by T-P engineers. It uses polynomial equations to define cam contour and the accommodation in the contour of factors which offset the dynamic characteristics of the cam and follower system.

developed in 1921, was a standard valve material for the next fifteen years. Thompson engineers have always worked closely with steel companies to develop valve steels giving longer life under severe operating conditions. During the early thirties silcrome XB was developed and became an industry standard for ten years, XCR, developed later, largely replaced XB, and is in heavy demand today.

A new approach to the problems of thermal fatigue is being explored by Thompson Products with this equipment. Designed to by-pass the usually lengthy and expensive engine test program, it permits a valve to be mounted within the induction coil in the center where it is alternately heated by the coil and cooled by a water-cooled seat.





Unique valve guide testing machine developed by Thompson Products for evaluating the wearing qualities of valve guide and valve stem materials under simulated, accelerated engine operating conditions.

Typical automotive products include: valves—automotive, truck, bus, and tractor; pistons—automotive, truck, bus, and tractor; locks and caps (valve retainer)—automotive, truck, bus, and tractor; cylinder sleeves; water pumps; steering linkages; piston rings; valve rotators; ball joint suspensions; hydraulic pumps—tractors; piston rings; and valve seat inserts.

A few of the special test devices used in developing new and improved products at Thompson Products are dscribed below. One of these is a valve guide testing machine, designed to evaluate the wearing qualities of valve guide and valve stem materials under simulated, accelerated engine conditions. It can be used to test either full sized valve guides or ¾-in. test bushings. The test specimens are placed in an adaptor which fits into a coiled G. E. Calrod furnace. The valve stem is placed through a guide specimen and attached to an oscillating shaft (*Turn to page* 102, *please*)

Increasing Foreign Barriers To U. S. Motor Vehicle Exports

BARRIERS TO AUTOMOTIVE EXPORTS

Currency Control

Direct Prohibition, or Quotas, based on

- Area of origin
- Size or Horsepower
- Price
- Assembled or Knocked-Down
- Percentage of previous imports
- Dollar allowance

Profits remisssion restrictions

Price penalties, including

- Duty—ad valorum or flat rate
- Taxes—purchase, use, luxury, fuel
- Ceiling prices
- Dollar premiums

Use restrictions

WITH sales of U. S. vehicles abroad declining, manufacturers are looking closely at restrictions to foreign sales. American plants in India are even being liquidated, because of barriers to imports.

Dollar shortages, strong nationalistic pressures, unemployment—these are some of the reasons behind new restrictions many countries are placing on vehicle imports. Restrictions take various forms; some of them are aimed particularly at the U. S. maker.

Exports of finished vehicles, knocked-down assemblies, and parts for manufacturing operations, have fallen off together. American assembly and manufacturing plants abroad, in which an estimated $500 million in U. S. funds are invested (including those making other than U. S.-type vehicles), often are finding operations curtailed for lack of materials from this country, while local substitutes are inadequate.

Reciprocal trade agreements between sterling and soft-currency nations add to the U. S. manufacturers' problems. Exchange difficulties and other changes in economic conditions apparently have increased the world market for lighter passenger cars, of the type not made in this country. British vehicle exports are about twice those of the U. S., although U. S. truck sales abroad are ahead slightly. West German and Italian exports similarly are increasing.

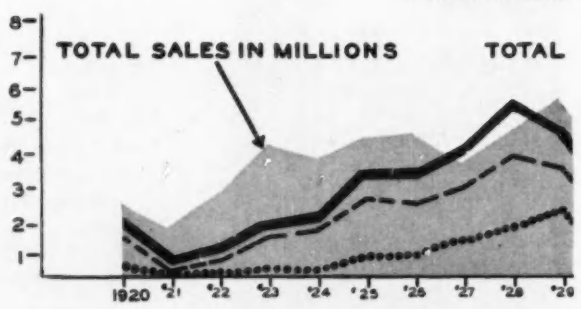
Recent changes in vehicle import restrictions abroad have been collected and summarized by countries, and reveal the trends which have caused purchases of American vehicles abroad to dwindle.

Argentina

A typical situation is encountered in this country. Foreign exchange for motor vehicle imports has not been granted since late in 1947. That year saw an all-time high in imports—nearly 62,000 vehicles—bought with accumulated gold and foreign credits from the war years.

One of two U. S. assembly plants closed, and the other followed shortly in 1948 for lack of parts. What few vehicles have been brought in since were imported "without use of foreign exchange," either by local dealers or the government.

EXPORTS AND



REASONS FOR AUTOMOTIVE BARRIERS

- Conserve dollars
- Combat unemployment
- Develop local industries
- Protect creditless industries
- Drive out foreigners

Germany reentered the market in 1950, and by last year provided more vehicles than the U. S. and more passenger cars (mostly of one make) than all other countries combined. U. S. lost first position to the United Kingdom in 1949, which in turn was outdistanced by Germany in 1952.

Only Diesel-powered trucks are allowed, under a recent administrative ruling. Since last June farm tractors over 20 hp also must be Diesel-powered. Tractor exchange permits are more liberal, and the U. S. still holds the lead in this item.

Australia

Nearly all members of the British Commonwealth give preference to imports from the sterling area, and Australia is no exception. It has a manufacturing and assembly industry of its own, although of course this is controlled largely from the U. S. and England.

North American imports of all types declined from 61 per cent in 1938-39 to 7 per cent in 1950-51. Australia-manufactured vehicles rose from none in 1938-39 to 28 per cent in 1950-51. Imports from the United Kingdom rose from 37 to 60 per cent in the same periods.

Import controls were established in 1952 limiting imports of assembled units and certain components to 20 per cent of base year imports, and unassembled vehicles and other parts to 60 per cent.

In addition, the scale is weighed heavily in favor of local manufacturing. The tariff has been an important factor in a rapid development of the industry, except for a shortage of steel which influenced local manufacturing recently. Tariffs, with local taxes, also influence the fluctuating demand which reached an all-time high in 1951.

Special banks of dollar currency established since World War II help promote home manufacturing by giving preference to those firms which intend to increase the percentage of local manufacture on vehicles being built of imported components. Expansion of concerns with manufacturing plants naturally was stimulated.

To encourage home industry, Australia gives a bounty of £30 for engines made there. The government admits certain machinery and vehicle components under tariff by-laws concessions, where these parts are not yet made locally but are vital to established industry. Special depreciation rates and government assistance in obtaining factories and tooling are other inducements.

Restrictions and tariffs on imports date back 35 years. Flat rates apply to various classes of parts, assemblies, and completed vehicles, on a basis preferential to Great Britain. A sales tax of 20 per cent on passenger cars and 12½ per cent on other vehicles further reduces the demand.

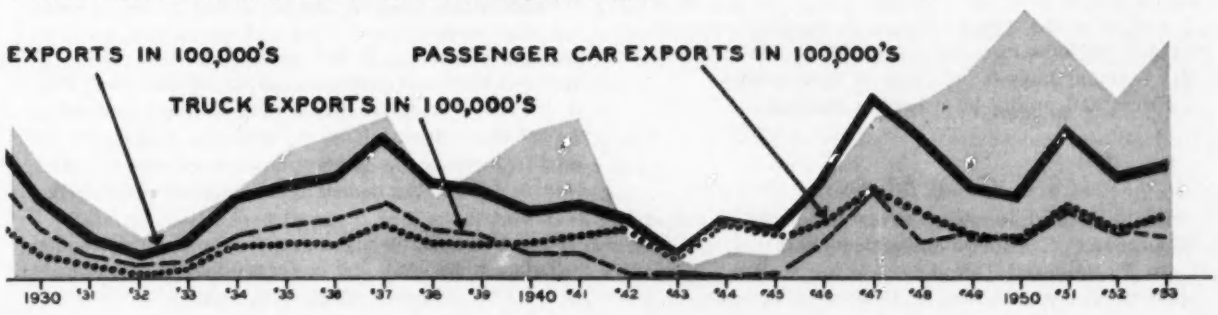
Belgium

Unemployment is responsible for new restrictions on imports of assembled vehicles after Jan. 1, 1954. Further expansion of a flourishing assembly industry was the goal; 17 American and 14 or more European vehicles are now put together there.

With minor exceptions, no finished passenger cars can be imported after that date. Several firms set up plants or announced plans to do so since the decision was reached in June, 1952. A corollary agreement was made with the Benelux partners so that European makes assembled in Belgium can be sold freely in all three countries.

Vehicles taxes, which make up about 10 per cent of the national budget, average about 24 per cent on parts brought in for assembly. Foreign exchange allocations for the few assembled vehicles allowed have been cut, while duties have been raised. (*Continued*)

TOTAL SALES OF NEW U.S. MOTOR VEHICLES, 1920-1953



Brazil

Imports of assembled vehicles for resale has been stopped since July 1, 1953. License applications for CKD (complete knockdown) shipments without upholstery are accepted. After Jan. 1, 1954, assembly plants must use parts made in Brazil wherever available, and duty is increased on imported parts.

Chile

For the last two years no exchange has been allocated for private passenger car imports. Here the reason apparently is to conserve exchange derived from gold mining, as there is no home industry to protect (a Ford assembly plant is said to use no local materials).

Trucks from non-dollar areas may be purchased freely. Parts and accessories, and trailers and farm tractors may still be imported from the U. S.

Denmark

Contrary to the trend, Denmark has relaxed import restrictions gradually in recent years. Value of imports of automobiles and parts more than doubled in a four-month period of 1953 over 1952, although truck imports fell.

Three schemes are available administratively under which to import automobiles. Some 16,000 passenger cars, one-third more than the previous year, will be allowed from OEEC (Organization Economic Eropean Countries) sources. They are rationed by the government. Choice of make is left to the purchaser, but ceiling price is about $1,295 fob.

American type cars manufactured in Europe can be purchased by paying an 80 per cent dollar premium in addition to regular excise duties.

Finally, domestic assembly of 1500 American cars was authorized beginning June, 1953, over the succeeding 12-month period. Employment problems are said to be behind this ruling.

Egypt

Since 1949 Egypt has not made an allocation of dollars for the private purchase of automobiles from the U. S. Importers have had to fend for themselves. What dollars were available through the Egyptian export pound and barter deals with third countries carried a premium of up to 25 per cent above the official quotation of the dollar. British exchange is not controlled, and substitute parts made there and in France and Germany have found favor at lower prices.

Prices and profits have been controlled.

Great Britain

While no change has occurred in the ban against imports of U. S. vehicles except for exhibition, imports from France and Germany are increasing. Trade agreements were signed in 1953 allowing some $5.6 million of German vehicle imports, and about $700,000 in French imports.

India

In mid-1953 the Indian government put into effect comprehensive measures to speed the growth of an automobile manufacturing industry. The measures are based on a year-long study of the Tariff Commission, and are viewed with doubts in some quarters.

To stimulate demand, import duties on spare parts and knocked-down assembly packs are reduced from an average 60 down to 40 per cent ad valorum. This will work out to benefit only manufacturers, however. Five of the 12 automotive firms in India are known as "progressive manufacturers" and are being encouraged to increase the proportion of local manufacture, even to having the models to be built selected by the government.

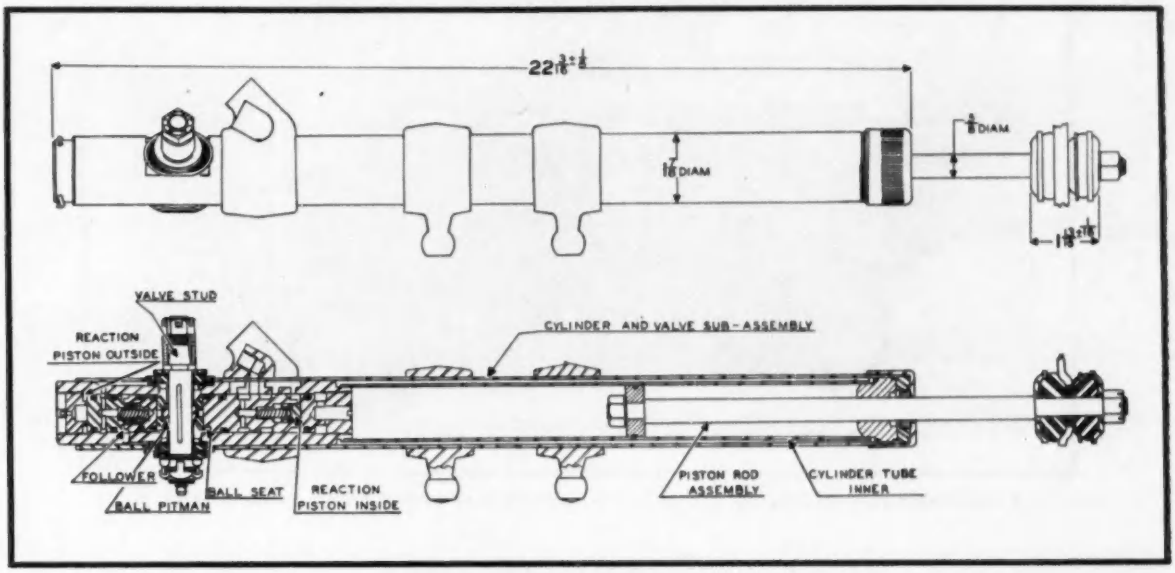
The others, primarily assemblers, will have smaller exchange allocations, and be forced out of the knocked-

(*Turn to page* 116, *please*)

AMERICAN AUTOMOTIVE PLANTS IN FOREIGN COUNTRIES

Argentina	4 Assembly (2 Distributor Owned)
Australia	17 Assembly (11 Distributor Owned) 2 Manufacturing
Belgium	8 Assembly (5 Distributor Owned)
Brazil	6 Assembly (3 Distributor Owned)
Canada	9 Assembly 3 Manufacturing
Chile	1 Assembly
Denmark	5 Assembly (2 Distributor Owned)
Egypt	1 Assembly (Distributor Owned)
Eire	4 Assembly (3 Distributor Owned)
England	1 Assembly 4 Manufacturing
France	1 Assembly 1 Manufacturing
Germany	2 Manufacturing
India	5 Assembly (3 Distributor Owned)
Indonesia	4 Assembly (3 Distributor Owned)
Israel	1 Assembly (Distributor Owned)
Japan	2 Assembly (both Distributor Owned)
Mexico	8 Assembly (5 Distributor Owned)
Netherlands	3 Assembly (2 Distributor Owned)
New Zealand	3 Assembly (Distributor Owned)
Norway	2 Assembly (2 Distributor Owned)
Pakistan	1 Assembly
Philippines	6 Assembly (Distributor Owned)
South Africa	8 Assembly (7 Distributor Owned)
Spain	1 Assembly
Sweden	5 Assembly (3 Distributor Owned)
Switzerland	2 Assembly (1 Distributor Owned)
Venezuela	2 Assembly (Distributor Owned)
Yugoslavia	1 Assembly (Distributor Owned)

28 Nations.
110 Assembly Plants, 66 Distributor Owned
12 Manufacturing Plants.



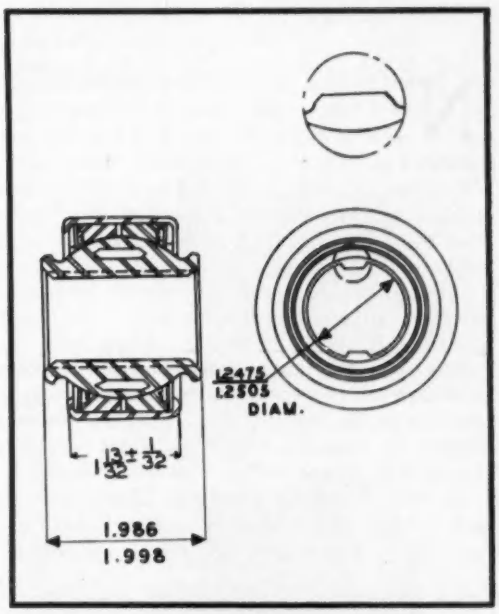
Bearing assembly for military shock absorber.

Monroe Develops Simplified Linkage Type Power Steering

POWER steering has become a highly competitive business with a relatively large group of manufacturers vying for the available applications. Added to this is the competition of the integral type gear with linkage booster gears which may determine in the near future whether both types will exist together or whether one or the other will have a clear field.

The Monroe Auto Equipment Co., a pioneer in the field of linkage booster power steering, has claimed that the Monroe design not only is relatively simple and low priced but makes for a light weight installation. As a matter of fact, a recent analysis made by the company shows that on one of the current installations on a car with parallel type linkage, the total weight of the conventional linkage is 35 lb, 4 oz, whereas the weight of the same linkage with a Monroe power cylinder is only 38 lb, 12 oz.

Since the introduction of the current design, Monroe engineers have been engaged in a program of development leading to further simplification both of design and fabrication methods. As a result of this effort they have come up with a new arrangement, illustrated here, which is simpler, lighter, and lower cost and may make possible installations weighing but little in excess of the weight of the usual conventional steering linkage units.



Exterior view and longitudinal section of the new linkage type power steering cylinder and valve assembly.

The design shown here is experimental and is not yet in production. However, it is understood that experimental samples already have been submitted to various car manufacturers for early testing.

The three outer brackets now are secured to the outer tube by hydrogen brazing instead of the present method of silver soldering. This feature alone aids in cost reduction.

(*Turn to page* 114, *please*)

A new one-ton model, the 3R14, with 131-in. wheelbase and gross vehicle rating of 9500 lb.

Studebaker Offers V8 Engine in Trucks for 1954

NEW styling, new cab and chassis details, and a V-8 power plant for the heavier-duty vehicles are features of the 1954 line of trucks announced by the Studebaker Corp. Designated as the 3R series, the trucks for 1954 range from the half-ton pickup to the heavy-duty two-ton unit and include five basic models. Gross vehicle ratings range from 4600 to 16,000 lb.

Studebaker's 1½-ton and two-ton trucks are now available with either the V-8 power plant or the six-cylinder Power Plus engine. Along with increased power is a four-speed synchromesh transmission as standard on all two-ton models and optional at extra cost on all the others. The heavy-duty transmission which was formerly available at extra cost on the 1½-ton models is now standard on those models.

A new wheelbase has been added to the one-ton series. The 3R14 one-ton truck will have a 131 in. wheelbase, nine-foot body, and gross vehicle rating of 9500 lb. It is powered by the six-cylinder Power Plus engine.

Three different power plants are available for the 1954 trucks: the six-cylinder Econ-O-Miser and Power Plus engines for lighter models, and either the new V-8 power plant or the Power Plus engine for 1½-ton and two-ton models. A compression ratio of 7.5 to 1 is standard for the Econ-O-Miser and V-8 power plants, with 7.00 to 1 standard for the Power Plus engine.

Wheelbases range from 112 to 195 in. Half-ton and ¾-ton models are available with wheelbases of 112 and 122 in., respectively; one-ton models are offered with wheelbases of either 121 or 131 in.; 1½-ton and two-ton models with wheelbases of 131, 155, 171, or 195 in.

Exterior changes include a new grille, headlamp, and bumper assembly. New one-piece windshields provide unusual forward visibility. These, coupled with the sloping hoods, are said to enable drivers to see the road to a point within a few feet of the front bumpers.

Tractors in France

(Continued from page 49)

cent of the parts used on the five models are interchangeable. With the exception of the smallest model, the Allgaier tractors are equipped with the Voith hydraulic clutch.

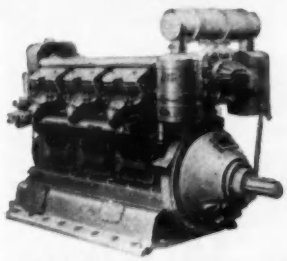
Mercedes displayed the Unimog, a vehicle of the Jeep type, with Diesel engine, four-wheel drive, winch, power take-off and equipment for road service and the maximum amount of work on the land. Deutz showed all aircooled Diesels, of one to four cylinders. Hanomag introduced a new model, powered by a single cylinder, two-stroke Diesel, with six forward and two reverse speeds. Five other types of wheel tractors and two creeper track models also were shown at the Hanomag booth.

Chechoslovakia sent two models of the Zetor, both wheel type with four-cylinder Diesel engines, and two models of the Steyr. These Steyr machines were of the wheel type, one had a single and the other a twin vertical Diesel. Hungary sent one model, the Robust, built in shops once owned by English Clayton Shuttleworth. This was a wheel type with a horizontal single-cylinder semi-Diesel engine.

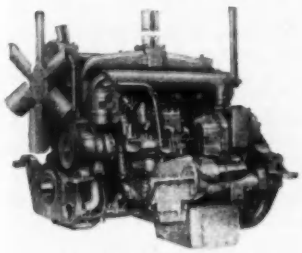
Of the 9714 tractors imported into France last year, 3199 came from Germany which has no assembly plants in France. Great Britain did the greatest business with 5639, which included Fords, David Brown and a portion of the Fergusons put on the market. If the United States sent only 98, this was because of the big local construction and assembly by such firms as McCormack, Massey-Harris, etc.

SOME *Famous* ENGINES EQUIPPED WITH SCHWITZER-CUMMINS SUPERCHARGERS

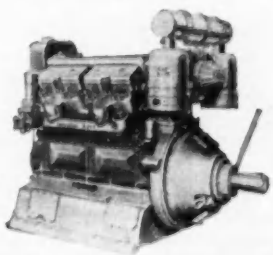
Model 687-C—Harnischfeger Corporation 6 cylinder, 2 cycle using two S-C superchargers.



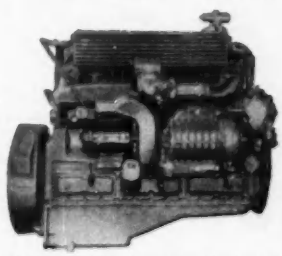
Model D-397—Caterpillar Industrial Diesel V-12.



Model D-337—6 cylinder—Caterpillar Diesel.



Model D-375—Caterpillar Diesel V8.



Model HRBS-600—Cummins Engine Company, Inc. (Used also on HBS Series.)

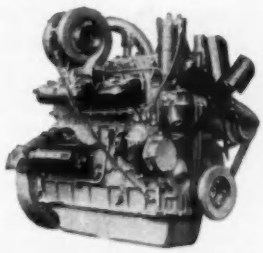
POSITIVE DISPLACEMENT TYPE—EXHAUST DRIVEN TURBOCHARGERS

More than twenty-five years of research, intensive engineering, wide field experience and unexcelled manufacturing facilities are back of our product.

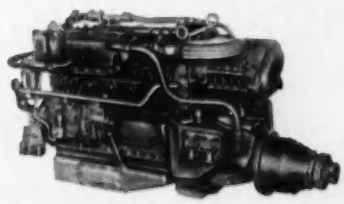
Its excellent service record in tens of thousands of applications under the most severe operating conditions has established Schwitzer-Cummins superchargers as a product of supreme reliability and efficiency.

We build superchargers for trucks, busses, earth-moving equipment, power plants, submarines, in fact for all uses up to 800 hp.

We can offer the last word in engineering assistance and the ability to produce efficiently.

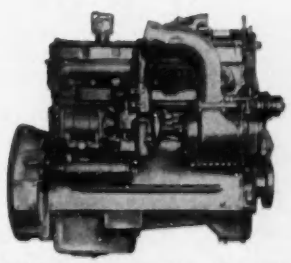


Model 135-DKBS—Waukesha Motor Company with Schwitzer-Cummins Turbocharger.



Model DIX6ES—Hercules Motor Corporation Diesel with Schwitzer-Cummins Supercharger.

SCHWITZER-CUMMINS
Also
Supercharges Engines
for
MACK-INTERNATIONAL
INGERSOLL-RAND
AND OTHERS



Model JBS-600—Cummins Engine Company, Inc. New High Speed Engine

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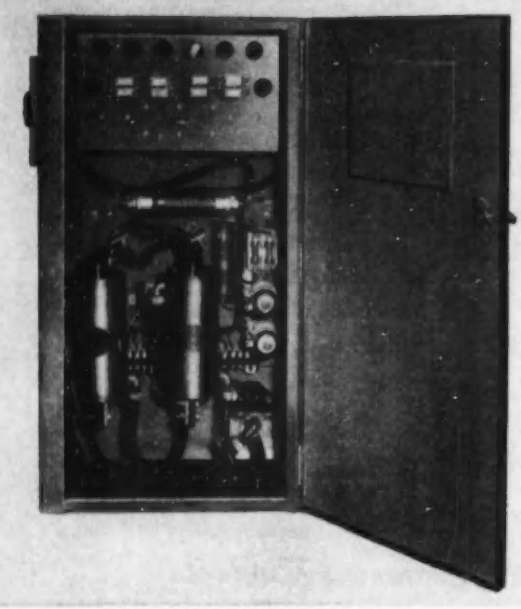
G-E Resistance Welding Controls Make Faster, More Accurate Welds



TYPICAL PANEL is neat, compact. Advanced circuit design is result of long experience in control design and manufacture. Spot-welding panel above is non-synchronous. NEMA Type N2.

The occasion probably will never arise when you'll have to weld 199 pieces of metal together, but you could—with G-E controls.

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Section H785-7,
General Electric Company
Schenectady 5, New York

Please send the following bulletins:

☐ **GEA-5816,** "The Story of Resistance Welding"; theory behind the process and complete description of all G.E.'s controls.
☐ **GEA-5945,** "Synchronous-Precision Control."

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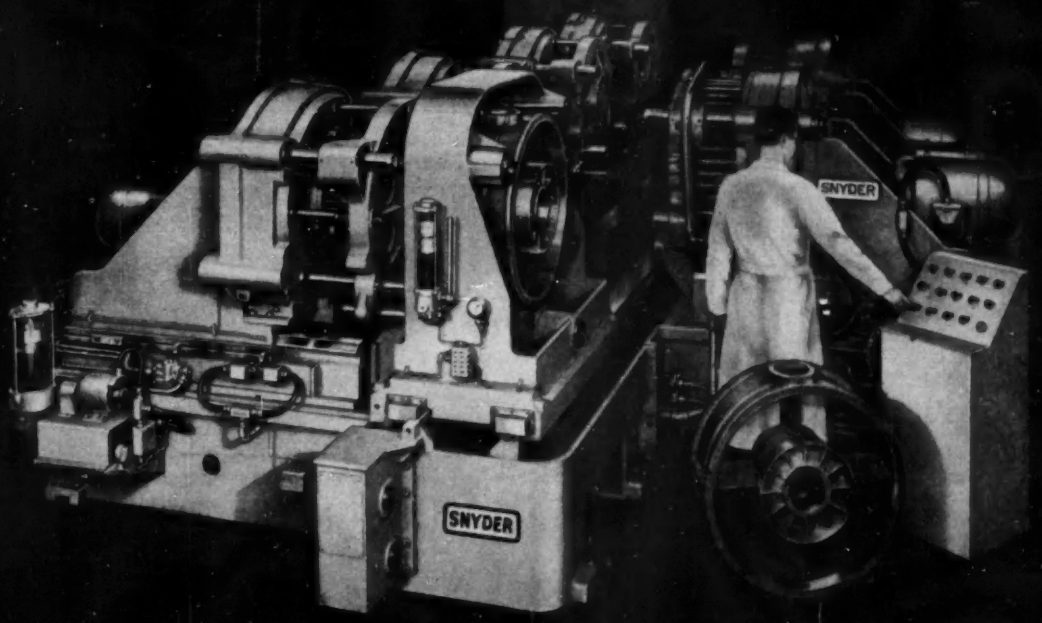
COMPANY .....
ADDRESS .....
CITY ..... **STATE** .....

GENERAL ELECTRIC



SNYDER SPECIAL

4-STATION, AUTOMATIC LINE INDEX

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CAST ALUMINUM AIRCRAFT PARTS

AT 80% EFFICIENCY.

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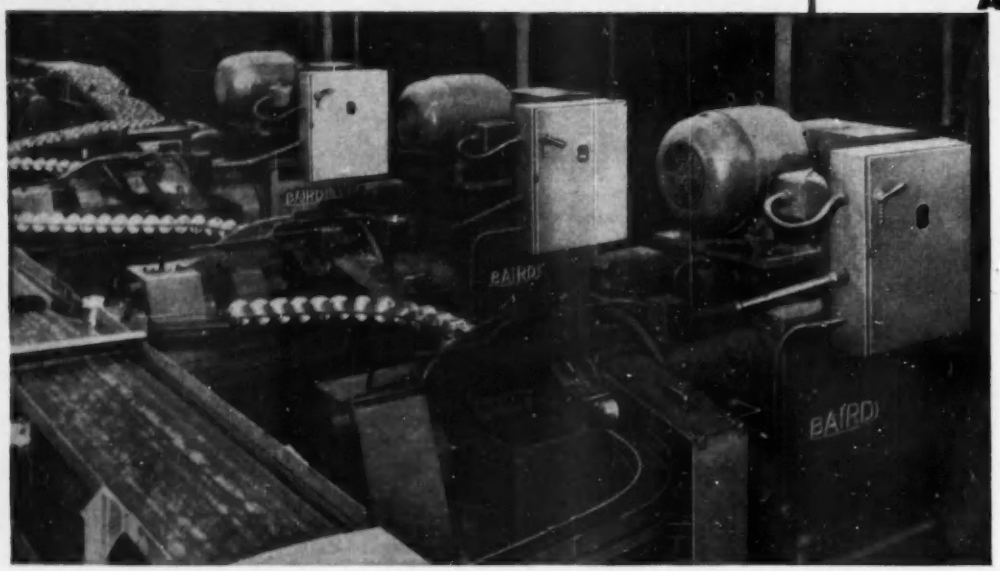
TOOL & ENGINEERING COMPANY
3400 E. Lafayette, Detroit 7, Michigan

29 Years of Successful Cooperation with Leading American Industries

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



ENGINE PISTONS *travel fast* THRU *automatic* ASSEMBLY *of* BAIRD 6-SPINDLE CHUCKERS

With push-button operation in many large metal working plants, the Baird Chucker has graduated from a valuable single unit to an invaluable assembly for completely automatic production lines.

Higher, constant speed is one reason . . . minimum manpower . . . and maintenance of close tolerances during continuous removal of metal is, perhaps, the outstanding feature. The photo above shows an assembly of three Baird Chuckers automatically machining engine pistons in a leading automobile plant.

In this instance, operations include finish turning of the engine piston and finishing the oil ring grooves to size.

This Model 76H Chucker (7″ chucks, 6-spindle horizontal machine) combines, in a single indexing cycle, such operations as turning, facing, drilling, tapping, threading, grooving and chamfering, if required.

Electrical and mechanical safety devices prevent damage when any motions are out of time or sequence. All tooling is easily accessible . . . spindle speeds are individual and variable. Design and construction assure long service life. If you require repetitive production of this nature . . . hand load or unload or entirely automatic . . . ask Baird about it.

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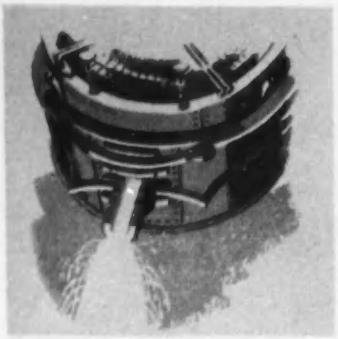
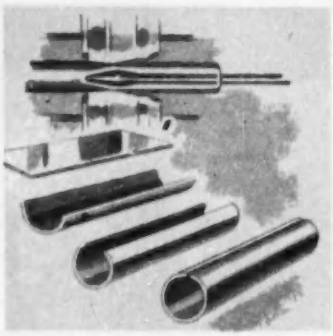
7 REASONS WHY Ostuco Single Source Service Saves You Money!



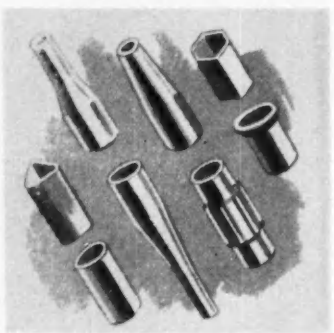
1. OUR OWN STEEL SOURCE. *As a member of the Copperweld family, Ostuco controls its own steel supply . . . your assurance of prompt deliveries.*

Wherever you use tubing in any form . . . or wherever the advantages of tubing will make your product more competitive . . . OSTUCO's *single source service* can save you money. One purchase order takes care of all details. Every manufacturing step from raw materials to finished product is carefully controlled and quality-checked. Your production schedules are rigidly maintained. Other advantages of OSTUCO's *single source service* are outlined in an informative booklet, "Ostuco Tubing," yours for the asking. Or better still—for conclusive proof—send us your blueprints for prompt quotation.



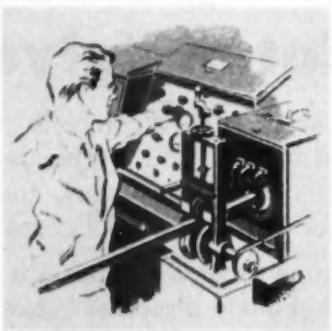
2. SEAMLESS AND WELDED TUBING. *As manufacturers of both seamless and electric welded steel tubing, OSTUCO's facilities are flexible to meet your needs.*

3. VARIOUS ANALYSES. *Ostuco offers carbon and alloy steels which meet all ASM, AMS, ASTM, AISI, and Federal specifications.*



4. FABRICATING AND FORGING. *Under one roof, OSTUCO's modern equipment and skilled craftsmen provide uninterrupted manufacturing, fabricating, and forging service.*

5. SPECIALTY ITEMS. *Ostuco is especially geared to handle smaller production quantities with the same economy normally possible only in larger runs.*



6. QUALITY CONTROL. *Rigid inspection and precision tests at various stages of manufacture assure homogeneous quality and uniformity.*

7. CONSULTANT SERVICE. *The diversified knowledge and experience of Ostuco's engineering and design departments is always at your service.*

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Observations

By Joseph Geschelin

Standard Quadrant

Some time ago the AAA issued a statement decrying the variety of shift patterns for current automatic drives, recommended uniform treatment similar to the standard gate for manual shift transmissions. From a standardization standpoint the suggestion has merit. On the other hand, it seems to us that standardization here does not have the same urgency as it did many years ago on standard transmissions. For one thing, the gate for manual shifting was completely enclosed and gave no clue as to its identity. Consequently, standardization was imperative for the sake of the millions of non-professional drivers. Automatic drives on the other hand, identify the shift pattern clearly on a remote quadrant making it easy for any driver to recognize. From a practical standpoint, the nature of the shift depends entirely upon the unique design of each transmission. The shift pattern cannot be changed without making all transmissions practically alike with respect to hydraulic system operation.

Strong Plastics

A great deal has been written lately regarding the role of reinforced plastics. Ford displayed an ingenious application just recently. The new Ford Thunderbird sports car, slated for production late this year, has an all-steel body. However, it is provided with a solid—quickly removable—top as as accessory. This top is made of reinforced plastic, finished to match the body color. It marks an excellent example of adapting reinforced plastic construction to items required in small production.

Gas Turbine

Another strong voice has been added to the current discussion of the role of the gas turbine in road transportation. Max Roensch of Chevrolet recently presented an excellent survey of the current situation at a meeting of API in Detroit. Emphasizing the known advantages of the gas turbine, he listed the disadvantages, particularly the problem of fuel consumption. Roensch feels that even if the gas turbine has a place it is more likely to be on trucks and buses. Even then it will have to beat the competition of Diesel engines as well as gasoline developments yet unborn.

Power Steering

In the summary detailing the growth of automatic drives and power steering (AI, February 15, 1954), we mentioned that power steering is on the cross roads. Ultimately, there may be a choice as between the so-called integral gear and the booster linkage gear. The latter now can be sold for less and may become cheaper. On the other hand, one of the specialists rises to tell us that with experience there is a reasonable prospect that an advanced form of simplified integral power system may become available within two years. This is expected to be so simple and so easy to produce that its cost may be well below that of booster linkage gearing. Here is a situation well worth watching.

Disk Brakes

Cars are getting lower, longer, heavier, and are endowed with enormous power. The basic problem now is getting deceleration comparable with the acceleration built into present models. Brake drums have just about reached the limit of size when housed within 15-in. wheels. For these and many other reasons, it seems necessary to take a look at more radical types of brake mechanisms. One of the most promising is the disk brake. It seems to offer better possibilities of larger friction areas within a cramped space and better cooling. Moreover, disk brakes lend themselves to the use of metallic friction lining which can resist relatively high temperature without fading. We look for a lot of activity in this field even within the year.

Pound's A Pound

Recent issue of *Magnesium Topics* states a truism—that a pound's a pound—regardless of how you save it. It credits Douglas Aircraft with the statement that a pound saved in the aircraft is worth $40 in additional payload. Use of magnesium in cast form is quite general in military and commercial aircraft, while substantial and increasing amounts of skin sheet also are employed, largely in military planes. The magnesium people believe that airframe designers may be overlooking the obvious fact that the weight saving of magnesium is just as potent in components other than highly stressed parts. That's where additional weight savings can be achieved.

Machinery Replacement

Since we are taking a big look at the parts makers, we recommend study of a good machinery replacement program suitable to the needs of individual manufacturers. Competition is so keen today that one must be sure to keep abreast of the latest developments in the machine tool field. Arrangements should be made to catalog and study every machine in the plant, particularly as to its condition, maintenance cost, cycles of down time, etc. Obsolescence rather than age is the controlling factor. No machine, regardless of age or condition, has a place in the production scheme unless it can compete with newer designs from the standpoint of rigidity, productivity, and relative costs.

AUTOMOTIVE INDUSTRIES . . .

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

National Machine Tool Builders' Association Gives Reasons Why Government Should Not Lease Its Machine Tools for Civilian Production.

Orders Up As Tools Go Civilian

That the machine tool business is on the increase is indicated in a report showing that new domestic orders in January were up 15 per cent from the previous month. While orders were about 32 per cent under the comparable period a year ago, new business in January went up to $50.3 million from December's $44 million.

With civilian orders coming in again at a "normal" rate, the industry expects no noticeable effect on business as a result of Government cutbacks and cancellations. Tool builders foresee a continuing return to civilian production.

Another interesting note which points up the optimism of the industry is the comparison of business received in recent months with the period between the end of WW II and the start of the Korean war. During the five-year period the monthly industry average was only around $26 million. Tool makers estimate that they'll do between $700 and $900 million in business this year.

The industry is also basing much of its hopes for increased business on anticipated passage of the Administration's new tax recodification bill. The measure would amortize rates on machine tools twice as fast as under former methods, giving tool builders a favorable cost factor to induce more replacement of worn and obsolete tools.

Total backlog of the industry dropped from 5.8 months in December to 5.6 months in January, and shipments climbed to an index of 319.6 in January from the previous month's 301.4.

Government More Optimistic

At the 30th Annual Meeting of the Machine Tool Distributors Association, held at Boca Raton, Fla., last month, Charles F. Honeywell, administrator of the Business and Defense Services Administration of the Department of Commerce, said that machine tool business should exceed $1 billion for 1954. He based this on the current backlog at the end of January of $600 million plus the $150 million the Department of Defense plans to spend in the next six months and an additional $100 million to be spent from the reserve tool program by the end of this year. Further, the machine tool industry shipped $94 million worth of machines during January. Adding these figures gives a potential of $944 million without further non-Government orders.

Leased Machines

In the latest issue of *Machine Tool Progress*, the National Machine Tool Builders' Association brings out that the Government owns one out of every five machine tools in the U. S. and that some of these machines are being leased for non-defense production, presumably under the so-called "escape clause" set up by the Office of Defense Mobilization. After the Korean war, it was brought out by Government and industrial officials that this country should maintain a stockpile of machine tools so that it would not become involved in the same crisis brought on by the advent of that war. The NMTBA points out that if these machines are leased for civilian production they will no longer constitute a reserve for emergency purposes. To back up this statement, the NMTBA gives three very obvious reasons:

1. Many of these machines now exist in the form of production lines, or in groupings associated with particular types of production. Leasing of individual machines would break up such production lines or such groupings, and render them useless until reassembled. This could take months.

2. Widespread leasing of defense machines for civilian purposes would result in scattering them throughout all sorts of plants all over the country. In case of emergency these machines could not possibly be brought back and re-aligned for military output in time to meet the need.

3. Machine tools are precision instruments. The making of weapons requires extreme accuracy. Machine tools leased for civilian production will not all be kept in proper condition and repair, will lose their accuracy, and may be useless for defense production when the emergency arises. Nor could Government assure that if and when returned for defense use, they would still have the tools and attachments necessary for their operation.

Track Type Tractors

(*Continued from page* 61)

form the Caterpillar Tractor Co., centered in Peoria, Ill.

During World War I, the track-type tractor inspired the design of the first tanks. Also during the first world war, Holt's crawler became the first standard U. S. artillery tractor.

In 1931, Caterpillar introduced the Diesel-powered tractor and set the trend for the present-day crawlers.

In World War II, the crawler-mounted bulldozer went into all theaters of war and performed many essential jobs.

Today there are approximately 340,000 crawlers of all makes in the United States, exclusive of the military.

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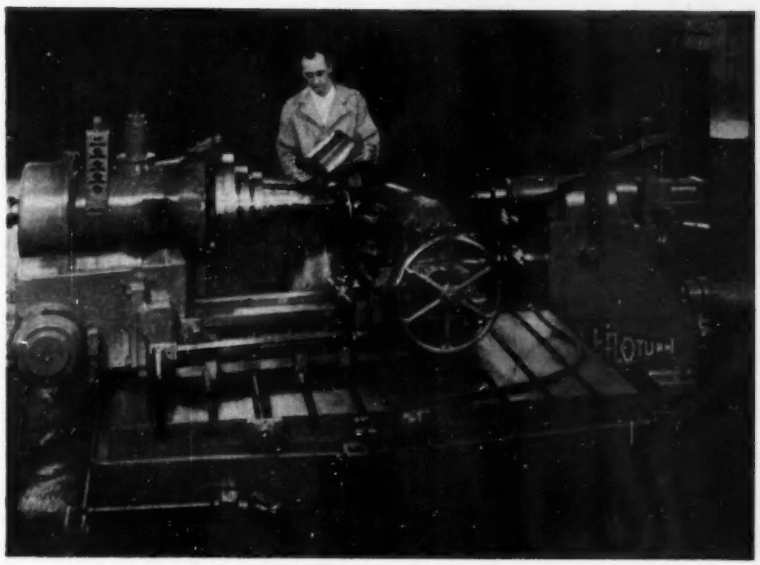
Forming Process Flows Metal Along Mandril



The No. 40 L&S Floturn machine for cold forming.

This stainless blank of AMS-5510, 21 in. square and 0.095 in. thick, was finished to a cone 27½ in. long along the slant, with a 0.027 ±0.002 in. wall thickness.

A process of metal forming developed for jet engine production is now available to industry generally. In the Floturn process, a simple flat blank or other shape is made to flow axially under great pressure, in the cold state.

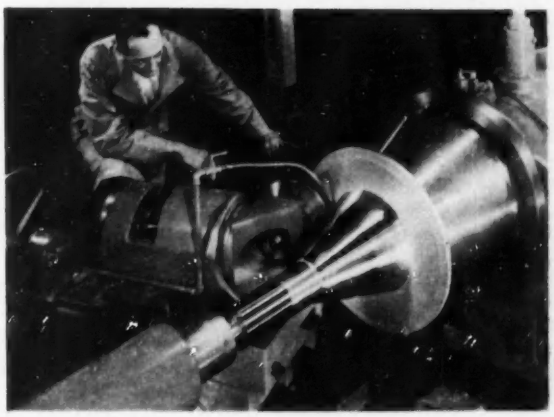
The machine consists of a lathe type bed, and head and tail stocks. A hardened and polished roller is attached to a compound slide mounted on a large table. The No. 40 standard machine will handle work up to 42 in. in diameter, finished to 24 in. long. A longer bed is available for work up to 50 in. long. Blanks of the harder metals may be worked up to 5/16's of an inch in thickness and softer metals up to ½ in. in thickness.

The process will handle a flat blank, machined blank, machined forging, drawn cup, wrapped and welded cylinder, or a centrifugal casting. Conical, cylindrical, or other complex shapes may often be produced directly to finished dimensions in a single pass. Dimensions can be held to ± 0.002 in. There is no spring back—the part conforms perfectly to the mandril.

The finished diameter is not limited to the developed diameter of a flat blank folded over, as in spinning. The finished size can be equal to the original diameter. Several new alloys may be worked by this method. Among metals successfully worked are: all 300 and 400 series stainless steels, Timken 16-25-6 and 17-225. Haynes Multimet, Universal Cyclops Uniloy 19-9, Inconel and Inconel X, Monel and K-Monel, Titanium T1-140-A, copper and aluminum as well as mild steel.

Tests show that strength and granular structure on many parts is improved through cold working, even after stress relieving. *Lodge & Shipley Co.*

Circle 56 on page 89 for more data



Close up of the hardened roller working on aluminum jet engine part.

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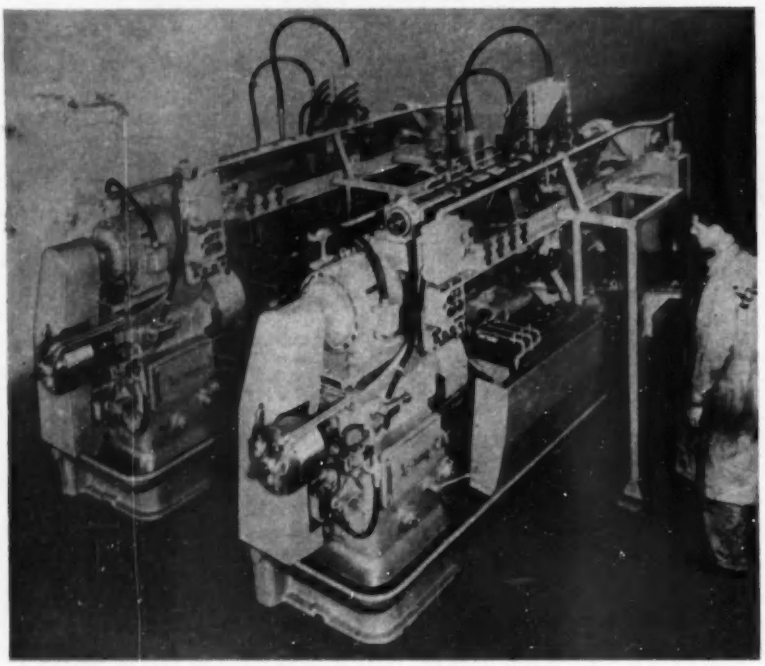
Automatic Loader for Lathe Work



Two standard five-by-34-in. model LR Lo-swing lathes with automatic loading equipment for turning cam shafts.

A principle of work loading and work transfer, now available on Lo-swing lathes, is said to offer impressive economies by carrying automation far beyond the cyclic operation of individual machines.

The first automotive installation is a two-machine setup for turning and gaging camshafts. The work loader consists of a conveyor line at right angles to the two lathes, and automatic carriers at each lathe operated by an overhead drum cam. The machines are sufficiently spaced to prevent easy access for tool changing and also to allow for a bank of 20 camshafts to be accumulated on the conveyor line between the two machines. With this buildup only one machine is shut down at a time for tool replacement.

The tooling is designed for rapid replacement. The front turning tools are fed with adjusting screws which are pre-set in the tooling room. The rear facing and chamfering tools are mounted in magazine type tool blocks similarly pre-set.

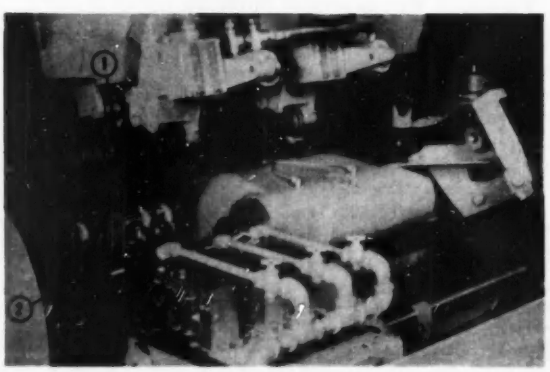
Gaging instruments at the automatic gaging stations are electrically operated. They indicate whether the points of inspection are oversize, undersize, or within tolerance by means of green, red, and a blackout of the lights respectively. If the part is oversize or undersize, it remains in the gaging station and the machine stops automatically at the end of the machine cycle for tool changing. The first machine is equipped with a three-dimension gaging assembly while the second has a four-dimension assembly.

In operation, the parts arrive on the gravity feed conveyor. A part is injected into loader arms which are clamped onto the workpiece. The transfer carrier advances the loader arm to the loading position over the center of the lathe. A semi-finished piece still held between centers is clamped by an unloader arm on the transfer carrier and removed after the tail stock spindle retracts and the chuck jaws open. After one piece is taken out, the other is inserted.

The transfer carrier returns to the conveyor and the unloader arm drops the semi-finished piece onto a turntable. The piece is rotated end for end and raised into the gaging station. A rough part has again been injected into the loading arm.

The semi-finished part is gaged, and if on tolerance, is lowered to the second part of the conveyor line which feeds parts to the loading station of the second machine. The transfer carrier of the second machine, with its loading and unloading arms, works in a manner similar to that of the first machine. *Seneca Falls Machine Tool Co.*

Circle 57 on page 89 for more data



Loading arm of the transfer carrier gripping the rough part (1), while the semi-finished part (2) is waiting for the unloading arm to remove it from the lathe.

Two Spindle Die Sinker Is Fully Automatic

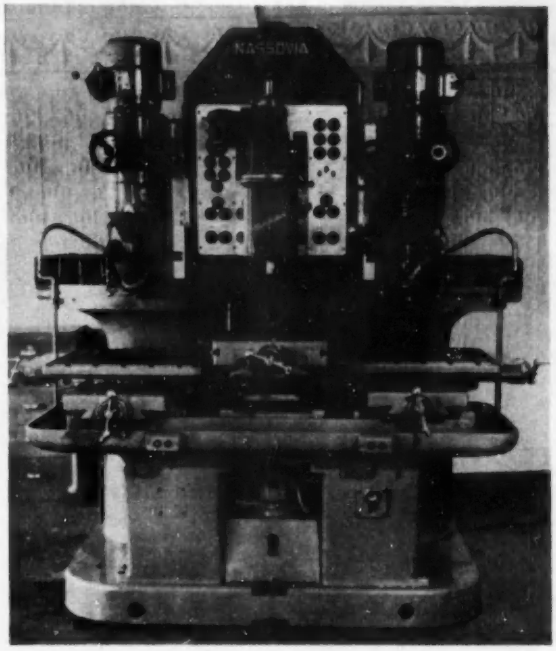
An automatic die sinker now being shown around the country is said to reproduce three-dimensional forming tools to a tolerance of 0.0004 in., with a surface finish of 0.00008-.0002 in. Vertical walls can be traced steplessly.

Made by Nassovia of Germany, the precision machine has adjustable work tables under each spindle, for aligning the work pieces with the master on the center table. It is built with interchangeable sets of spindles for rough or precision work: one has a speed range steplessly variable from 150 to 2900 rpm, and the other has a speed range of 3000 to 18,000 rpm. Other dimensions include a table clearance of 22 in., and a working range of 31 in. longitudinally, 16 in. traversely, and five in. vertically with an additional six in. of manual correction.

The vertical pin tracer exactly duplicates the profile of the cutter used. It moves vertically and longitudinally at any position, and traversely at the end of each longitudinal stroke. Movement of the two cutters is determined by the tracer through three hydraulic pistons.

The electro-mechanical preselecting tracer acts simultaneously as a tracing, measuring and controlling element, by means of a unique eccentric drive. This drive anticipates for the cutter the motion of the tracer, when it hits the master while moving in any direction.

As a result of an intentionally superposed small downward tendency the tracer and cutter move slowly downward until contact with the master is obtained. The master is then being copied by the tracer device.



The Nassovia die sinker for rough work or precision finishing.

During idle running of the machine, before the tracer pin has contacted the master, the tracer and cutter perform a small horizontal rotary probing motion. If this motion is interrupted by the master, the tangent is measured in relation to the point of contact. The tracer is set into the appropriate advanced position and initiates cutter movement in the same direction. The tracer is thereby lightly pressed against the master at an angle of about 30 deg in relation to the measured tangent. As a result of the quick measuring of the tangents the tracer glides steplessly along the master at a low contact pressure. The cutter follows the same movement. In this manner, vertical walls can be traced steplessly up and down. By using correspondingly shaped tracer pins, even re-entrant forms can be traced. *Carl Hirschmann Co.*

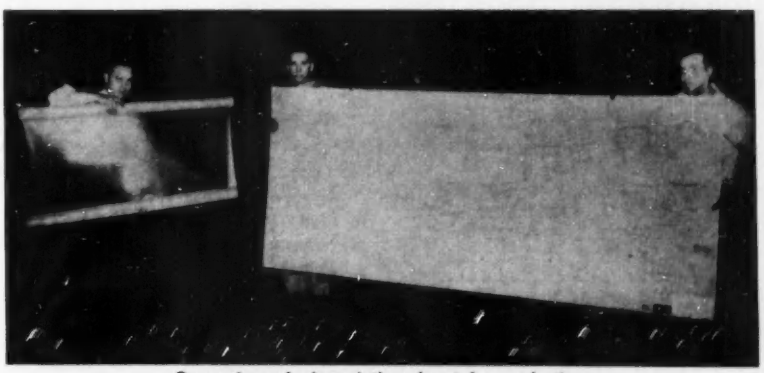
Circle 58 on page 89 for more data

Glass Cloth for Drafting

A photo-template material is said to be cutting costs of drafting and reproduction. A four by 12-ft reproduction formerly made on the painted surface of a metal sheet of that size now requires merely a roll of the new material, as shown.

The template material is made by impregnating cloth woven from continuous glass fibers with a blend of Rohm & Haas Paraplex polyester resins. The result is a sheet material with dimensional stability equal to or better than that of the metal it replaces, but with transparency greater than that of tracing paper. No projection camera is required, as copying is done without distortion on a contact printing table in which vacuum holds the original firmly against the copy. Silver emulsions, Diazo or any of the usual sensitizing materials may be used. Drawings made be on metal plates can be copied rapidly on the sensitized glass cloth by reflex printing. *Tru-Scale Engineering Supply Co.*

Circle 59 on page 89 for more data



Comparison of glass cloth and metal reproduction.

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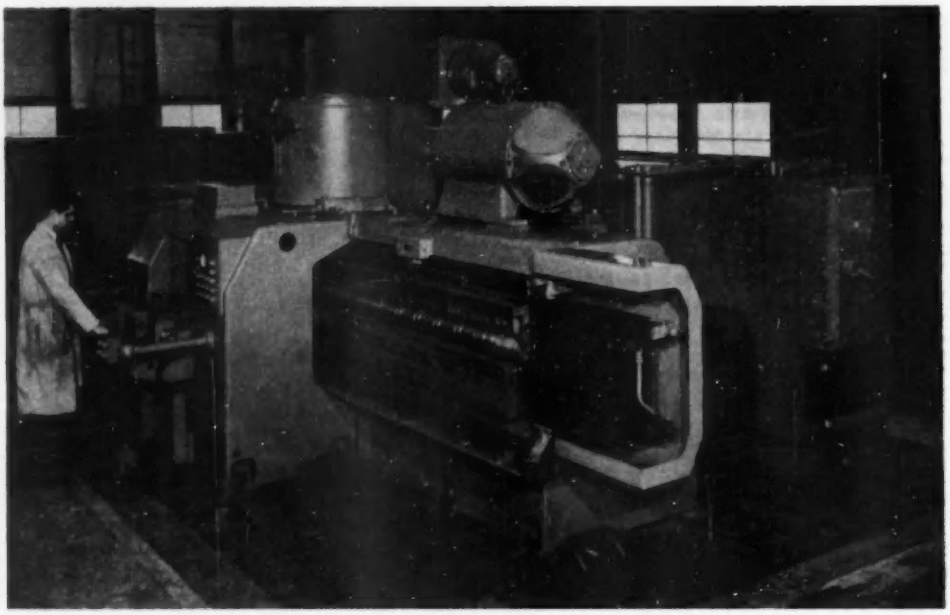


Colonial model HM-25-130 double-acting broach.

High Speed Broach

A standard high-speed double-acting mechanical drive, electrically controlled broaching machine with hydraulically actuated fixture, has a maximum stroke of 130 in.

Ram speed of the Model HM-25-130 is infinitely variable from 30 to 150 sfm in both directions. Both the ram speed and the length of stroke can be increased to meet even higher requirements for specific broaching operations.

Design of the machine makes it suitable for various types of worktable construction such as trunnion, rotary, shuttle, etc. A jog control panel is provided for use in set-up and tryout.

Width of the ram is 24 in. Drive for the ram is supplied by a direct current motor rated at 150 hp at 750 rpm. The motor is coupled to an 18-in. center distance, 20:1 ratio, Cone-Drive double-enveloping worm gear set driving a precision ground helical pinion which in turn drives a rack to provide ultra-smooth, high-capacity drive for the ram. The machine is capable of developing a peak of 300 hp. *Colonial Broach Co.*

Circle 60 on page 89 for more data

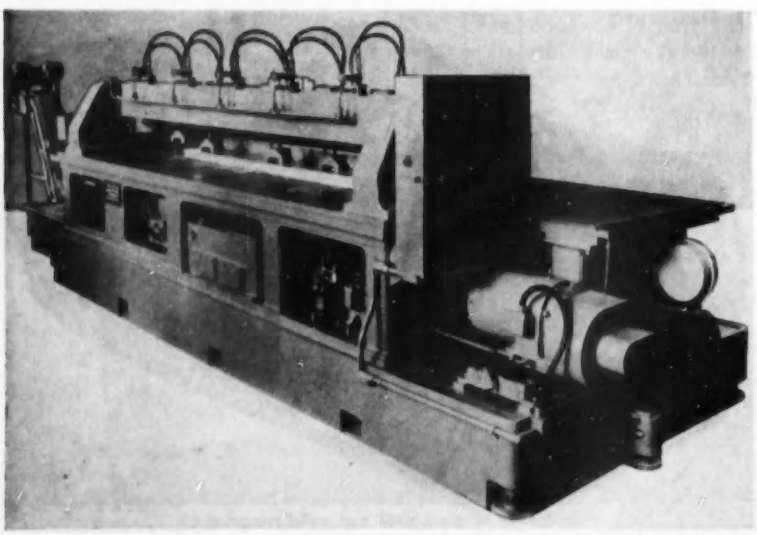
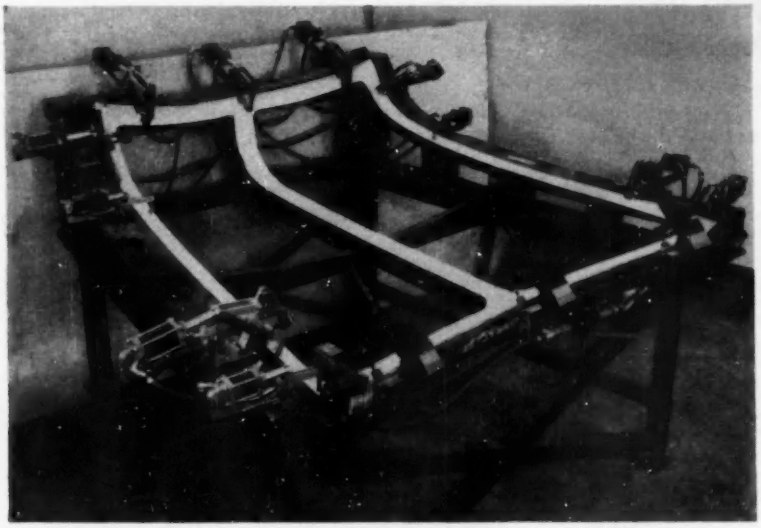


Plate Saw for Aluminum

This high speed plate saw accurately handles aluminum plates up to four in. thick and 12 ft long. Coolant sump, chip compartment and chip conveyor are built in. The surface of the plate is equipped with freerollers in small cylinders, actuated hydraulically to raise the stock from the surface of the table. The stock is clamped by a heavy rail with direct-acting hydraulic cylinder hold-down clamps which can be positioned along the rail to the most desirable position. A single-speed saw head mounted on a dovetail slide beneath the table has variable feed rate. (The Motch & Merryweather Machinery Co.)

Circle 61 on page 89 for more data

Resin for Cold Laminating



This welding fixture, for a hood assembly, is typical of fixtures that can be made with conventional cast iron or steel framing, suitably faced with reinforced plastic.

A dimensionally stable tooling plastic now available is designed for laminating without heat or pressure. The thermosetting resin is non-toxic, non-corrosive, and easy to patch. It it not brittle, and is said to be readily bonded to any backing material.

In addition to being recommended for master models, mock-ups, and welding fixtures, it is said to be ideal for dies for forming, stretching, and casting.

When the plastic is laminated at atmospheric pressure with a plain weave untreated glass textile, 0.013 in. thick with minimum average braking strength of warp of 430 psi, and filling 400 lb per in., the following physical properties are obtained: tensile strength, 20,000 psi, compressive strength, 25,000 psi, flexural strength, 40,000 psi.

In addition to plastic materials, glass cloth, glass fibers, and accessories, the company also supplies a wide variety of tubing, centers, corners, and T-joints. These tubular accessories make it possible for the fabricator to build light weight, structurally strong framing for the gamut of checking fixtures, aircraft fixtures, checking racks, etc. The resulting construction produces relatively large parts of such light weight that they can be readily handled by one or two men, depending upon the size of the part. *Ren-ite Plastics, Inc.*

Circle 62 on page 89 for more data

Press Force Adjuster

A Warco hydro-pneumatic force adjustment device, applied to a double-action press, acts as safety overload protection for the blankholder and provides a means for adjusting the blankholder pressure independently at all four corners. Pressure up to the capacity of the device can be applied at any corner.

With the conventional rigid blankholder, pressure is regulated by mechanically adjusting the point at which the blankholder meets the blank. Variation in the thickness of the blank, due to either stock thickness tolerances or thickening of the blank during the draw, will either raise or lower the blankholder tonnage or holding effect. The tendency in making draws with double-action presses is to set the blankholder for the minimum blank thickness, thereby increasing the blankholder tonnage for the average blank, increasing the drawing tonnage. In the event that redrawing is necessary, excessive blankholder tonnage induces excessive elongation and cold working, which may mean an additional annealing operation or may cause a fracture in the drawn part.

The hydro-pneumatic force adjustment unit makes it possible to determine the blankholder pressure required at each corner, and to duplicate this setting whenever the job is rerun without having to repeat the blankholder setting required with the rigid blankholder. It also provides a positive safety overload protection in case of double blanks, as the device will detect the double blank and stop the press before damage to the press and dies occurs. *The Federal Machine and Welder Co.*

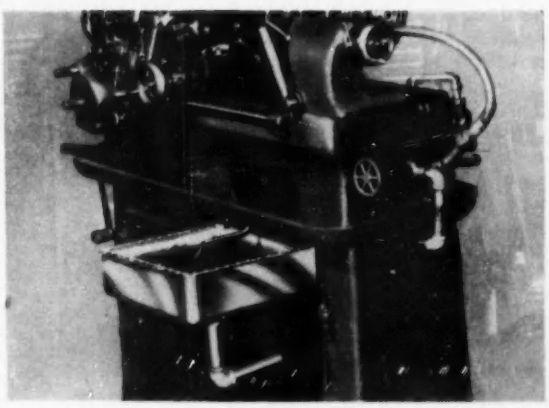
Circle 63 on page 89 for more data

Lighter Filter

The Delpark Junior, a continuous filter for low coolant flow, is designed to offer more efficient machine operation and less down-time for tool correction and dressing for grinders, shavers, cutters, hobbers, lappers, borers and hones.

Continuous positive filtration removes abrasive solids from the coolant as it comes from the work. The filter comes complete with combination mounting bracket and clean coolant return line, or if preferred, a connection is available for separate pipe or hose. *Industrial Filtration Co.*

Circle 64 on page 89 for more data



A woven wire basket holds the disposable filter tray in the Delpark Junior.

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89

Broach Loaders

Red Ring automatic loaders, designed to speed output of externally broached round parts on conventional dual ram vertical broaching machines, are made in a wide variety of types.

In order to accommodate specific parts, they feature magazine feeds and simple, compact feed, clamp and eject mechanisms. No auxiliary power source is required to actuate the loader mechanisms since the in-and-out travel of the dual ram broaching machine tables is utilized to impart motion to the loader feed and clamp components.

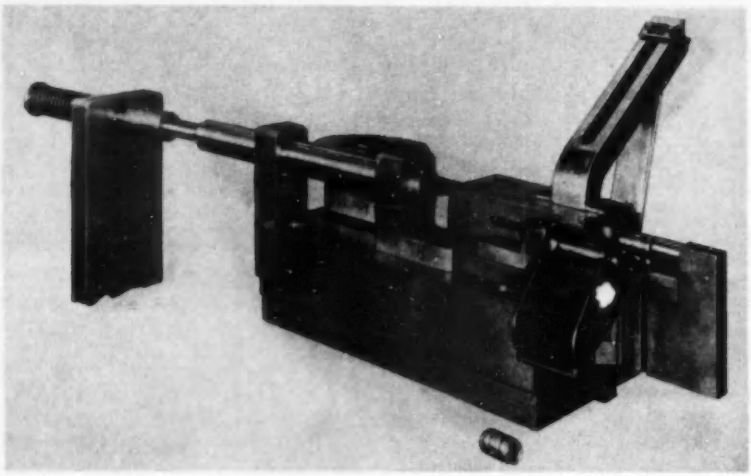
Round parts such as valve spools, universal joint needle bearing cups and similar parts on which flats or slots can be surface broached are ideally adapted to automatic loader applications. Output of the loaders is limited only by the speed of the machine. An operator keeps the feed magazine full and the finished parts are automatically ejected into trays or tote boxes.

The loaders consist of a fabricated steel base that supports the magazine feed chute, feed and clamping mechanism, and unloading chute. This unit is mounted on one of the dual ram machine tables. A plate that actuates the loader through control rods is bolted to the front of the broaching machine base.

The one or more surface broaches used in conjunction with the automatic loading devices are mounted on a broach holder, that is keyed and bolted to one of the machine rams. This holder design permits the broaches to be mounted at right angles to the ram surface, thus enabling the parts to be fed and ejected at the side of the machine with the loaders moving in and out with the machine table.

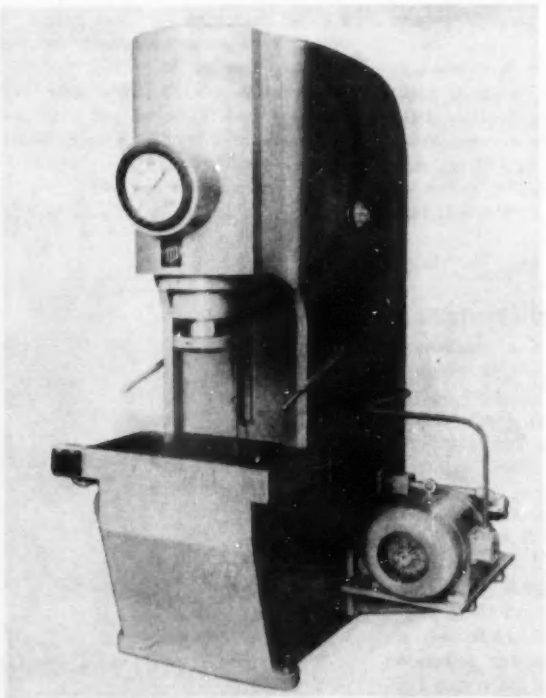
The magazine feeds are designed in such a manner that parts will not enter the loaders in incorrect endwise location for broaching. *National Broach & Machine Co.*

Circle 65 on page 89 for more data



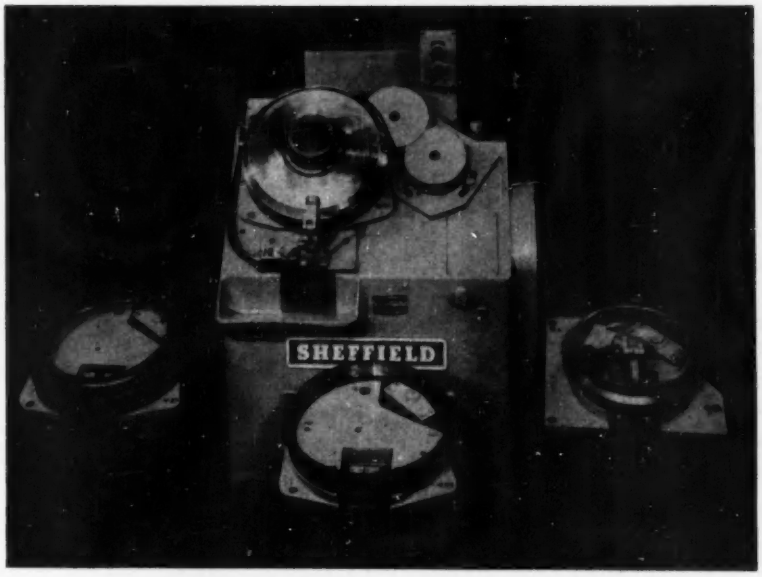
This loader, shown with cover removed and without a broach holder assembly, broaches flats in three grooves in a 1.300-in. long, 1.0-in. dia hydraulic valve sleeve. When a part of the loader clamp jaws has been finish broached, the loader retracts with the table.

100-Ton Straightening Press



A vertical hydraulic straightening press with rapid advance, power pressing, and rapid return stroke is manufactured in 75, 100 and 150-ton capacities. It can be supplied, as illustrated, with a large dial-type pressure gauge and remote control adjustment for relief valve setting. The hydraulic circuit includes two separate pumping units both of which are used for the rapid advance and return stroke. Only one of the units is used to develop the maximum pressure used for the power pressing stroke. A decompression valve in the hydraulic circuit automatically prevents high pressure shock when the machine ram stroke is reversed. (American Broach and Machine Co., division of Sundstrand Machine Tool Co.)

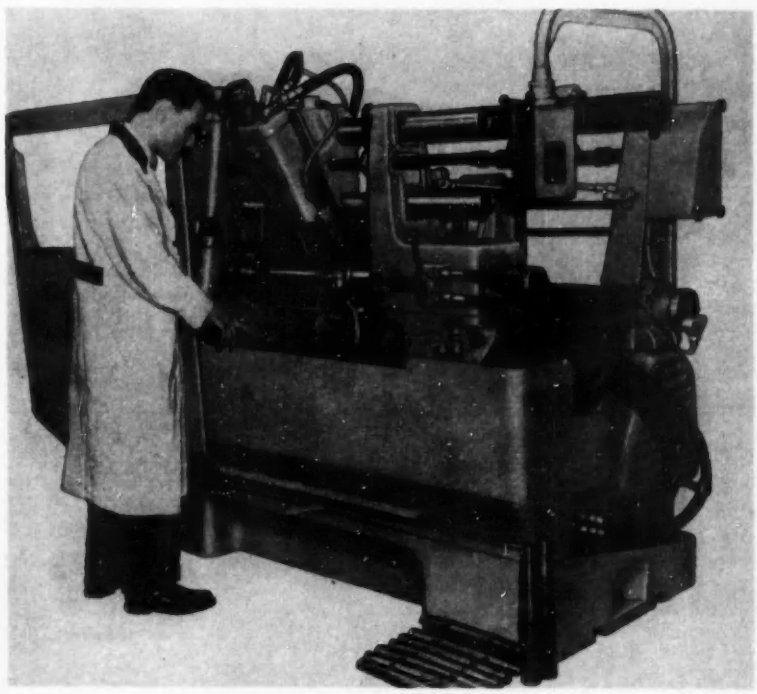
Circle 66 on page 89 for more data



Machine Chamfers Gear Teeth

Model 388 internal burring machine is designed for chamfering the involute contour of internal spline and gear teeth, either straight or helical around their full form. Production rate depends upon the diameter and pitch of the gear teeth but is said to be up to and including 300 teeth per minute. It is a universal machine tool and can be changed over from one type of gear to another in less than 30 minutes. (Sheffield Corp.)

Circle 67 on page 89 for more data



French Lathe to Be Built Here

Arrangements have now been completed for the manufacture of French H.E.B. automatic copying lathes in this country. They are to be built by Industrial Metal Products Corp. of Lansing, Mich., and will conform completely to the J.I.C. standards. Distribution will continue through dealers established. (H.E.B. Machine Tools, Inc.)

Circle 68 on page 89 for more data

Hg Power Drive

Development of a new mercury rectifier variable-voltage power drive designed for a broad range of industrial applications requiring adjustable-speed service is announced. Identified as the Xatron V*S Drive, the single anode mercury pool rectifier tube now gives industry another way to convert alternating current to controlled d-c variable voltage for application to adjustable-speed drive equipment. It is designed for on-the-spot use where needed, rather than for a central installation with d-c distribution.

The first size of air-cooled Xatron rectifier available, operating in a three-phase bridge arrangement, provides conversion suitable for 30, 40 and 50 hp drives. It is also expected to find uses in several other fields besides voltage-controlled drives.

Supplementing the adjustable-speed drive equipment made by the company during the past 14 years, the V*S Drive with Xatrons consists of the operator's control station, the adjustable-speed drive motor, and the control unit, which is enclosed in a cabinet 56⅝ in. wide, 65¾ in. high, and 28 in. deep.

The control units are substantially lighter in weight—and for 40 and 50-hp drives smaller in size—than control units including rotation conversion equipment. Use of the multi-phase bridge circuit makes possible the regular use of drive motors of the same physical size as used with rotating conversion.

The control unit incorporates six single anode, air-cooled mercury tubes, each arranged as a unit with its respective saturable reactors, magnet, and exciting bank. Operating from a three-phase power supply with a full-wave bridge to give a six-peak d-c output, the tubes are grid controlled by an electronic phase-shifting circuit. Assembled as a unit mounted on a base, which also serves as an air-pressure chamber for a blower supplying filtered cooling air, they are pre-wired, interconnected back-to-back and three on a side, and arranged in individual L-shaped panels located over the air chamber.

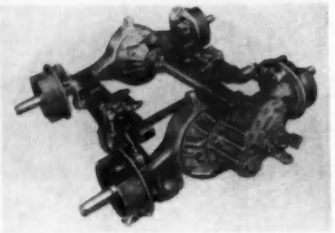
In contrast to drives previously utilizing gas-filled rectifiers with relatively short life span, this equipment is said to overcome this problem with a rectifier having high life expectancy. It uses the same basic design as European mercury pool rectifiers which, in use for many years, enjoy working life spans comparable with that of rotating equipment. *Reliance Electric & Engineering Co.*

Circle 69 on page 89 for more data

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Tandem Axle with Power Divider, Lock

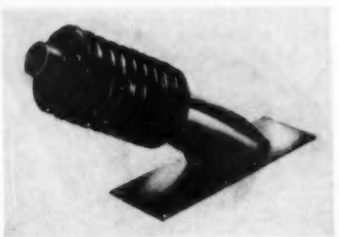


Volume production of model 32M tandem axle, with a load capacity of 32,000 lb on the rear tires at the ground, has been announced. The new size bridges the gap between present models of 28,000 and 36,000 lb capacity and meets the legal maximum in 37 states, comprising some 90 per cent of the total truck market potential.

An inter-axle third differential in the power divider assures equalized power transmission to the driving wheels even though wheel speeds may be variable due to road irregularities or differences in tires. *Eaton Mfg. Co.*

Circle 36 on page 89 for more data

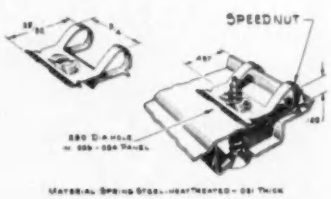
Neoprene Sleeves Formed Without Molds



Flexible, telescoping sleeves of neoprene-base materials of several thicknesses now are being fabricated. The part illustrated performs the dual function of dirt exclusion and gear case lubricant retention. Protection is afforded for a 1¼ in. hex rod that has a six-in. horizontal movement, 13/16-in. rise and fall and at the same time swings on six-in. levers which are operating to 30 deg either side of the vertical. For high speed flexing, 0.033 in. materials are used. For machinery that moves more slowly, but imposes more severe duty, 0.050 in. materials are fabricated into the overall design. *A&A Manufacturing Co.*

Circle 37 on page 89 for more data

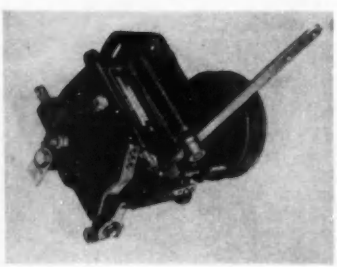
Nut Holds, Grounds Lamp Housing



A large truck manufacturer recently cut assembly time and eliminated a two-parts handling job with a special, dual-functioning "J" type Speed Nut for fastening parking lamp housings. Designed with an extra large loop, the special type is slipped by hand over the panel edge of the truck body, where it holds itself under live spring tension. The lamp housing is then positioned, and a 10A screw is driven into the nut. *Tinnerman Products, Inc.*

Circle 38 on page 89 for more data

Universal Pulley Governor Easily Fitted

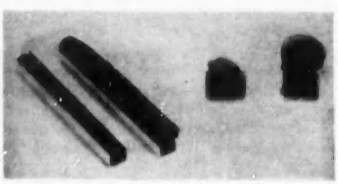


The C-15 universal governor is applicable to practically all engines, according to the manufacturer. The extended actuating splined lever shaft makes it possible to shift the lever from one side to the other, or up and down, in a few moments time, for left or right hand mounting. The cover may be rotated in any one of three positions.

All of these are furnished with variable speed levers. With a cable or rod attached to this lever, the governed speed may be varied according to requirements. *Hoof Products Co.*

Circle 39 on page 89 for more data

Sealer Expands Volume Twice



An extruded rubber based sealer features 100 per cent solids content that expands uniformly over the entire length of the sealer bead when heat cured. Applied in the form of a flexible rubber strip, EC-1209 sealer cures and expands when heated to form a positive, uniform, gasket-like material between metal surfaces. It seals and prevents squeaks. *Minnesota Mining and Mfg. Co.*

Circle 40 on page 89 for more data

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FREE LITERATURE

One-Ton Lift 1

A 2000-lb capacity fork truck, F-26T, designed for fast tiering and available in two lift heights, is described in a four-page folder issued by the *Elwell-Parker Electric Co.*

Sealing 2

A 20-page illustrated catalog covering its entire line of sealing compounds used in the manufacture of automobile bodies and mobile homes has just been published by the *Presstite Engineering Co.*

Opposed Drills 3

Opposed spindle drilling machines combine the speed of a two-way drilling machine with the flexibility of a radial drill and the accuracy of a horizontal boring machine. Bulletin WPH-8-53. *Walter P. Hill, Inc.*

Forgings, Castings 4

Smooth hammered forgings, composite die sections, and cast-to-shape tool steels produced by the Forging and Casting Div. are described in a new booklet, which outlines forged shapes available, stainless as well as tool steel, and weight limits, as well as analyses. Information is also included on how to use and order composite die sections. Diagrams of standard shapes are also included. *Allegheny Ludlum Steel Corp.*

Fifty Years' Growth

How the growth of the automobile industry parallels the 50-year history of a leading manufacturer of automotive parts, is graphically told in a 40-page booklet illustrated in color. The brochure pictures the firm's early days, and shows the ten plants in operation today through the guiding efforts of founder C. W. Spicer and board chairman C. A. Dana. It is available to responsible executives in firms engaged in automotive vehicle manufacture who write to *Spicer Mfg. Div. of Dana Corp., Toledo 1, Ohio.*

Wire Rope 5

A carefully compiled condensation covering the most important characteristics of wire ropes and how to select them, describes the different uses for various grades of wire, how to select the most suitable lay and core, the proper applications for eight commonly used wire rope constructions, and other topics. *Bergen Wire Rope Co.*

Mg Floor Trucks 6

Thirty models of lightweight magnesium platform hand trucks in ten sizes up to 36 by 72 in. weigh only 50 to 75 lb. Bulletin MPT-151. *Magline, Inc.*

(Please turn page)

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Leaded Steel 7

Super La-Led, a free-machining, open hearth, leaded steel bar now available in a wide range of sizes, contains about 0.25 per cent lead and nearly 0.50 per cent sulphur. *LaSalle Steel Co.*

Grinding Handbook 8

The 36-page Cylindrical Grinding Handbook is filled with useful information to reduce cylindrical grinding costs, improve quality and train operators. It distills the experience of thousands of shops into 17 useful chapters, for operating executives, methods men, engineers, supervisors, operators and apprentices. *Landis Tool Co.*

Diaphragm Valve 9

Two-page Specification Sheet 425 on pressure balanced diaphragm motor valves stresses application of these outlet-pressure regulators to jet engine test cell fuel lines. *Minneapolis-Honeywell Regulator Co.*

Measuring Flow, Liquid 10

A dozen systems for measuring and controlling liquid level are described in 24-page Bulletin 1160. Brief general sections on measurement, transmission and control, also handling of difficult liquids. Also included is two-page tabulation of twelve systems for quick comparison. *Minneapolis-Honeywell Regulator Co.*

Automatic Controllers 11

Controllers for automatic production testing, proof testing and yield strength by the extension under load method are described, as well as stress (load) cycling, strain (unit deformation) cycling and crosshead cycling, in Bulletin 48. *Tinius Olsen Testing Machine Co.*

USE THIS POSTCARD

Carbide Drills 12

Carbide-tipped and solid carbide drills including an improved regular spiral twist drill with heavier web and tip, are described in circular No. 541. *Super Tool Co.*

Dynamometers 13

A 16-page, two-color booklet, detailing its complete line of liquid-cooled, absorption, motoring, universal and special-purpose dynamometers, has just been released by the *Dynamatic Div., Eaton Manufacturing Co.*

Resin Specifications 14

A group of polyester resins available for low-pressure fabrication of reinforced plastics are completely specified physically and chemically in a 30-page technical report, CDC-238. *Chemical Div., General Electric Co.*

Generate Milling 15

Transfer milling of hemispherical combustion chambers in cylinder heads is a feature article in Vol. 10, No. 4 of Report from *Cincinnati Milling Machine Co.*

Production Tips 16

Superfinishing a transmission sun gear shaft is the lead article in the latest four-page Round Table production tips bulletin by *Gisholt Machine Co.*

Carbide burrs 17

Kellerflex carbide burrs for a wide range of applications are cataloged in 18-page circular No. 564. *Pratt & Whitney Div. of Niles-Bement-Pond.*

Crush Truing 18

A digest of useful data on crush truing begins in Vol. 44, No. 11 of Grits and Grinds. *Norton Co.*

"Instrumentation" 19

A few of the feature articles in the 48-page fourth quarter issue of *Instrumentation:* Heat treating of aluminum at Lockheed; System Engineering including frequency response testing; Heat treating giant gun barrels at Midvale Co., and information on some new products of *Minneapolis-Honeywell's Industrial Div.*

AI Index 20, 21

Check 20 on postcard for an index to Vol. 109 (July 1 to Dec. 15, 1953) of AUTOMOTIVE INDUSTRIES. A limited number of copies of the index to Vol. 108 (Jan. 1 to June 15) are available. Check 21 on postcard if you want this index also. *Automotive Industries.*

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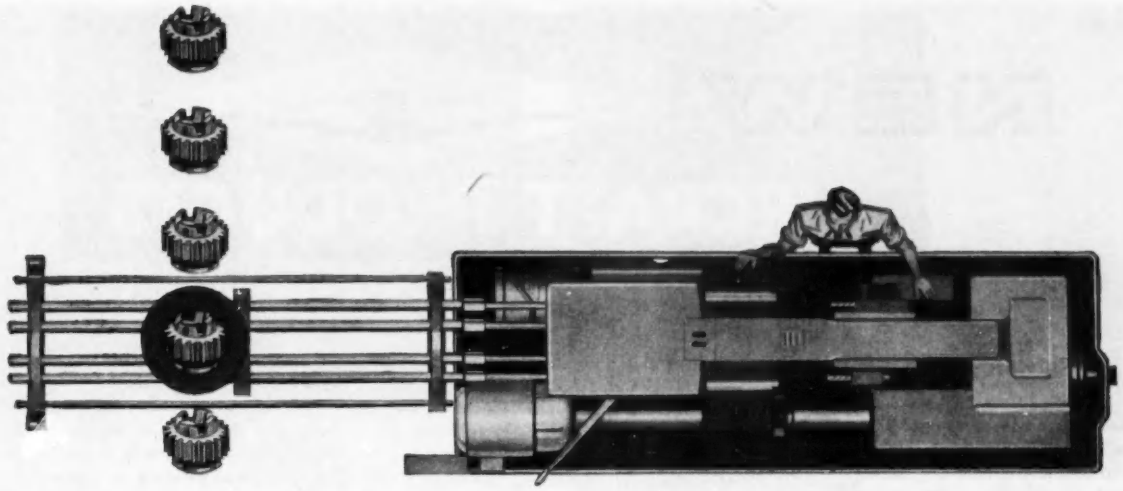

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NEW AIRCRAFT PRODUCTS

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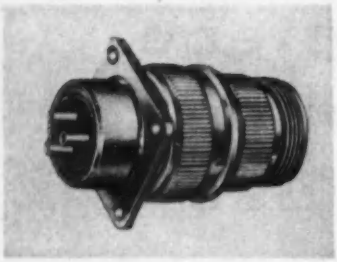
Electric Connector

A high temperature connector to carry circuits through aircraft fire walls and other high ambient areas provides a positive fire barrier for at least 20 minutes, and uninterrupted



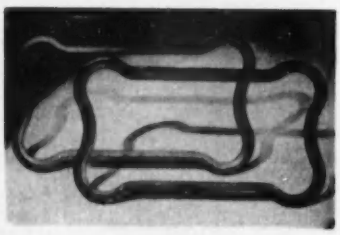
power for at least five minutes, when vibrated during exposure to a direct 2000 F flame. This performance is made possible by the use of Mycalex inserts cushioned by silicone wafers and housed in stainless steel shells.

One of the very important applications for the connector illustrated is the protection of propeller control circuits at the aircraft fire wall. Of additional interest is the ability of this new design to withstand excessive and continuous vibration. *Scintilla Div., Bendix Aviation Corp.*

Circle 46 on page 89 for more data

Rimmed Gaskets

These gaskets have metal rims bonded to the rubber, to keep them in their proper shape and position dur-



ing assembly. The shape of the mating parts is extremely complicated, and without the metal to hold the rubber gasket in rigid shape, it would be almost impossible to assemble the two parts and be certain that during the assembly the flexible rubber gasket remained in its proper location. Rubber used in these gaskets is Buna N, but they could be made from any type of rubber or synthetic, the choice of materials depending, of course, on the operating temperatures, fluids to be sealed, etc. *Acushnet Process Co.*

Circle 47 on page 89 for more data

Rubber-Glass Duct

A silicone rubber-fiberglass duct connector was granted CAA approval as an acceptable replacement for metal bellows units in aircraft engine supercharger inlet ducts. It withstands compression, expansion and misalignment, and at the same time offers greatly improved resistance to high pressures and to operating temperatures from —100 to 700 F and higher.

The new duct connector offers considerable saving in weight, is comparatively low in cost and due to its exceptional flexibility can be easily installed. Standard hose clamps are satisfactory for most installations. *Arrowhead Rubber Co.*

Circle 48 on page 89 for more data

Plastic Hose

Now in production on a pilot-plant basis is Fluoroflex-T plastic hose, which is said to be chemically inert to highly corrosive liquids. Made of DuPont Teflon compound with stainless steel armor braids, it is designed particularly to handle synthetic oils and fuels under the severe operating conditions of jet engines. It is also expected to find application on various types of guided missiles using corrosive fuels and oxidizing agents and on all hydraulic systems requiring non-corroding conduit.

The manufacturer claims that the hose will retain its strength and flexibility at temperatures from —100 F to 450 F, has practically unlimited op-

erating and shelf life, absorbs vibration and resists failure due to fatigue, has a minimum working pressure of 1000 psi, is light in weight with thin outside diameter for its sizes, and permits field assembly of fittings. It is presently available in a range of seven sizes from ¼ in. to one in., and three additional sizes will soon be added to the line. *Resistoflex Corp.*

Circle 49 on page 89 for more data

Tough Rubber

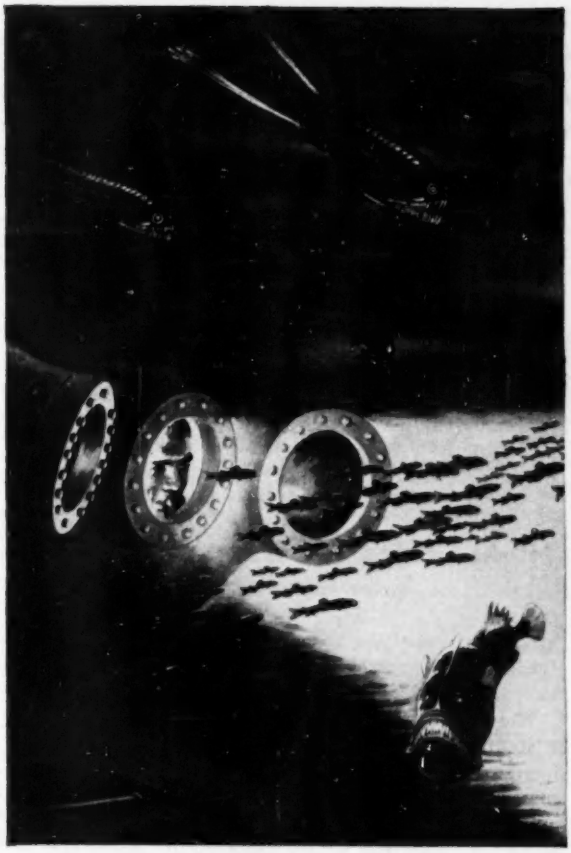
Super-Tough silicone rubber, with a tear strength averaging 190 psi, has been developed for aircraft, chemical processing and similar rugged applications. It is available in grades 15060, 15080 and 15081.

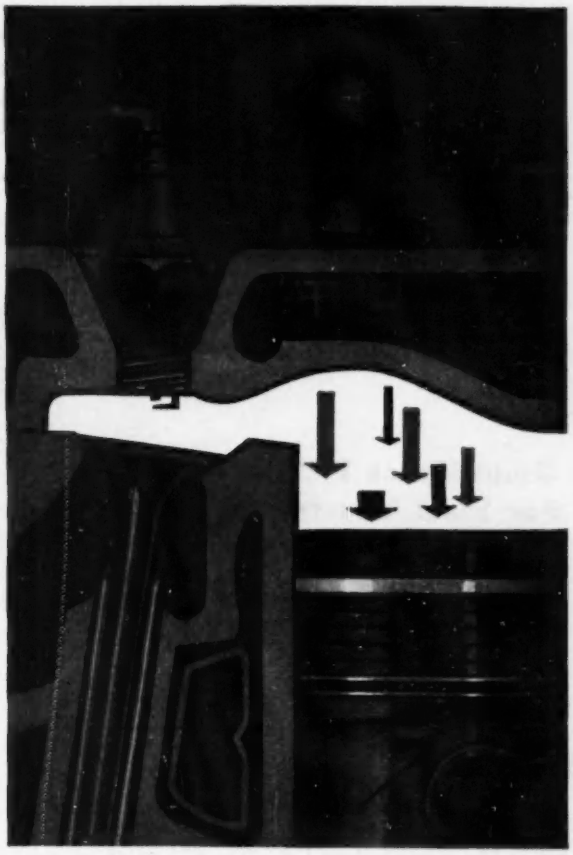
"O" rings and gaskets, made from this type rubber, have proved satisfactory as seals for synthetic base oils at temperatures as high as 375 F. Super-Tough is also recommended for molded ducts and connectors for hot air lines, particularly where oil mist is present.

Grade 15081 was described as having very low compression set properties and all grades are said to have excellent resistance to both heat and cold. Flexibility is maintained over a range of minus 65 F to 550 F.

All grades of Super-Tough Silicone rubber are available in molded form from the *Plastics Dept., General Electric Co.*

Circle 50 on page 89 for more data





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METALS

Steel Production Still Lags. Copper Price Holds Firm. Zinc and Lead Prices Strengthen. Sharp Advance in Price of Tin.

By William F. Boericke

Usual March Pick-up Absent For Steel Industry

Steel men hope that the old March adage, "in like a lion, out like a lamb," will be reversed for their industry. The impatiently awaited pick-up had not developed by mid-March and disappointed a lot of producers who had counted heavily on a March upturn. The steel operating rate fell to 69 per cent rated capacity. In three weeks time it had declined five points which brought it down to the lowest point since March, 1950.

For the week ending March 15 production had fallen to 1,642,000 tons. The percentage drop in production was not as large as the decline in operating rate because the latter is based on the 1954 rated capacity of 124.3 million tons, whereas capacity was 117.5 million tons in 1953. The 69 per cent operating rate does not apply to all companies. U. S. Steel operations were believed substantially higher and Armco reported 90 per cent, except for its stainless bar and wire division which was at 50 per cent capacity.

But the steel producers are still optimistic. April is now the crucial month. Actually, they say, the situation is better than the statistics indicate. The rate of incoming new orders improved in March but their size was disappointingly small. It appears that the mills had greatly underestimated consumer inventories of steel and while considerable progress has been made in readjustment, a lot remains to be done before the situation is satisfactory. Mill inventories themselves were top heavy at the start of the year and production cut-backs were delayed. Hence their own inventories are none too comfortable yet.

Base prices are still generally maintained but consumers are receiving the equivalent of a price cut in getting quicker delivery, better quality, elimination of extras, and freight absorption. Competition among producers is keen for available business. Some steel products are still in good demand, notably structurals because of the excellent outlook for construction aided by the open weather. Oil country goods are wanted.

Steel Scrap Prices Near 1949 Level

At mid-March the *Iron Age* composite price for steel scrap was down to $23.50 per long ton, within hailing distance of the postwar low of $21 in 1949. The present price is little more than half the $44.92 paid in August, 1953. Demand is discouragingly low, with the larger companies out of the market. Dealers in scrap have small incentive to make collections. The abundance of scrap supplies has had its effect on demand for pig iron and iron ores. One of the smaller New Jersey iron ore mines laid off 200 men because of the sharp decline in demand for its product from the steel mills.

Higher Price for Copper Scrap

Unlike most other non-ferrous metals, copper holds tenaciously to the same high price of 30 cents per lb attained a year ago, much to the discomfiture of most trade oracles who had freely predicted a price decline months before now.

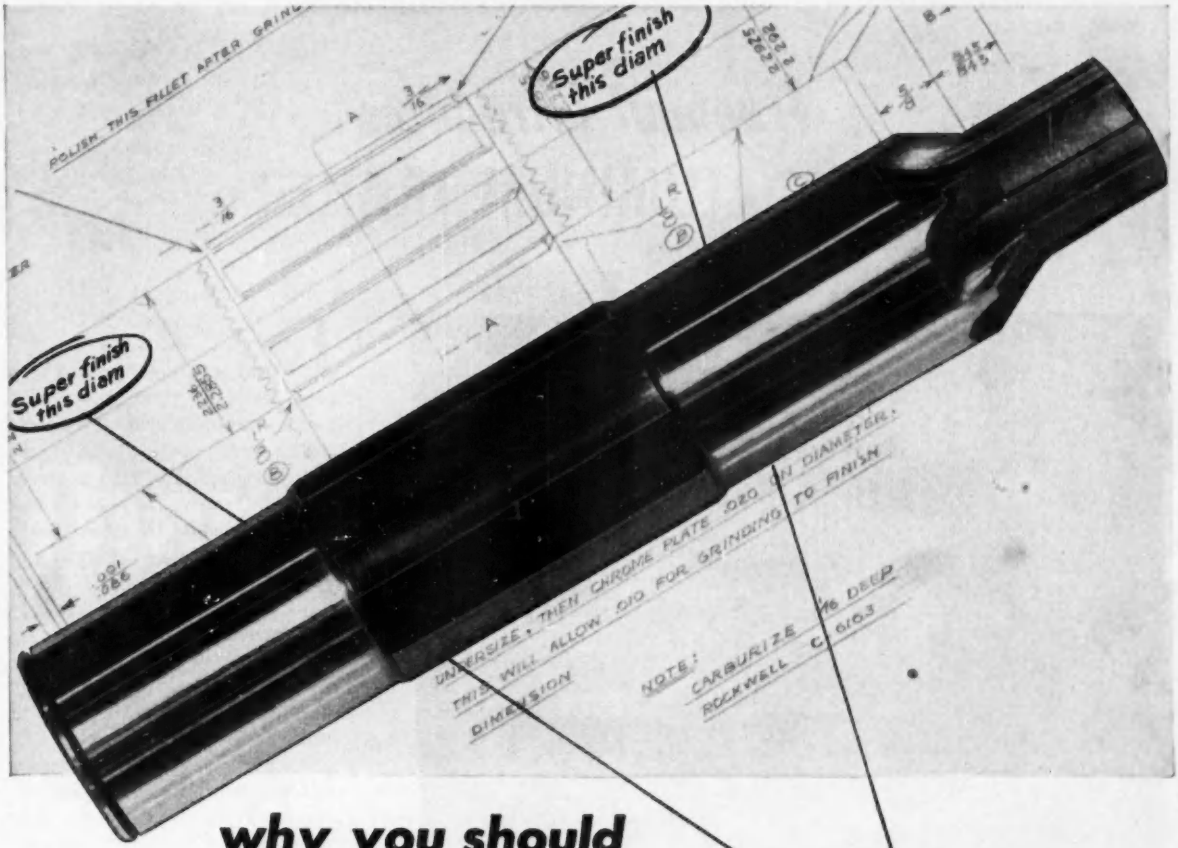
Not only has the price for electrolytic held firm but custom smelters have been forced to advance their buying price for copper scrap to new high levels. In mid-March No. 2 scrap sold for 24 cents per lb. Allowing about four cents for processing, this indicates about 28 cents per lb for electrolytic deliverable 90 days hence. Quite evidently no severe price break is expected before then.

On the N. Y. Commodity Exchange spot copper has been extraordinarily firm, with nearby positions advancing almost daily. The same thing has been witnessed in London, where spot copper has been quoted about 29¾ cents per lb N. Y. equivalent.

A variety of explanations are offered for this surprising strength in the red metal. The continued stalemate in the Chilean situation has cut off large supplies of copper that would normally be moving to this country. A prompt cut-back in domestic mine production by the leading producers as soon as they sensed an abated domestic demand has brought new output down to about 63-65,000 tons per month, compared with an average of 80,000 tons per month in 1953. Meanwhile, copper deliveries by foreign fabricators to customers outside the United States have shown steady increases month by month to 92,300 tons in January, more than double the deliveries in August, 1953.

Thus the immediate outlook is for a continued firm copper market. Less confidence is felt when the impact of full production by Chile hits the market. This could well mark a downturn in the price. This was admitted by officials of Phelps Dodge Corp., who stated that with full Chilean production available for sale, it seems at least possible current production will exceed the current demand and readjustments may be necessary involving production reduction or a price decline or both.

(*Turn to page* 100, *please*)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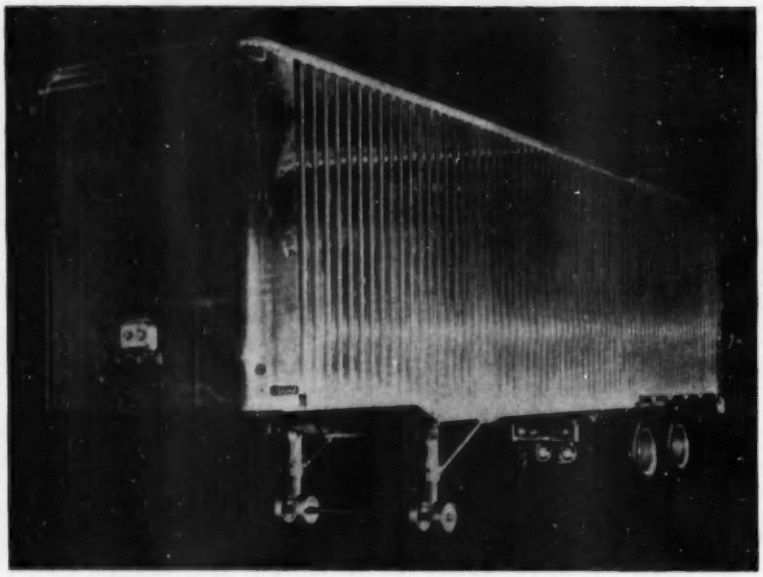
Fruehauf Introduces
NEW ALUMINUM TRAILER

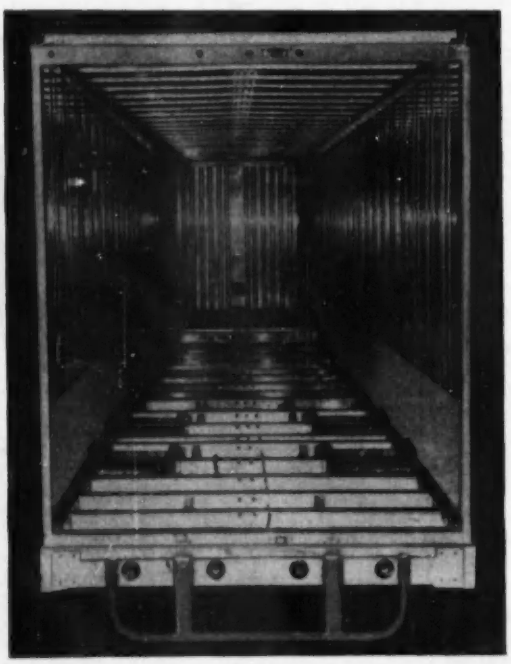


Hi-Cube corrugated aluminum trailer mounted on six-inch drop frame with adjustable gravity tandem.

USING advanced design, the new Freuhauf "Hi-Cube" corrugated aluminum trailer provides more storage space for its length and height than any previous Fruehauf unit. Its special construction results in extra inches of inside width, height and length.

Because of door design, the new model also offers minimum restrictions in loading and unloading with actual door space equivalent to the full height and width of the trailer interior.

The six-inch drop frame model equipped with Fruehauf adjustable gravity-tandem is illustrated here. This unit will also be built as a straight frame model with any type of Fruehauf under-construction. It will be made with interchangeable components which will permit it to be built in a number of different styles. Quantity production on these units is scheduled for July.



Interior Construction of the Hi-Cube trailer.

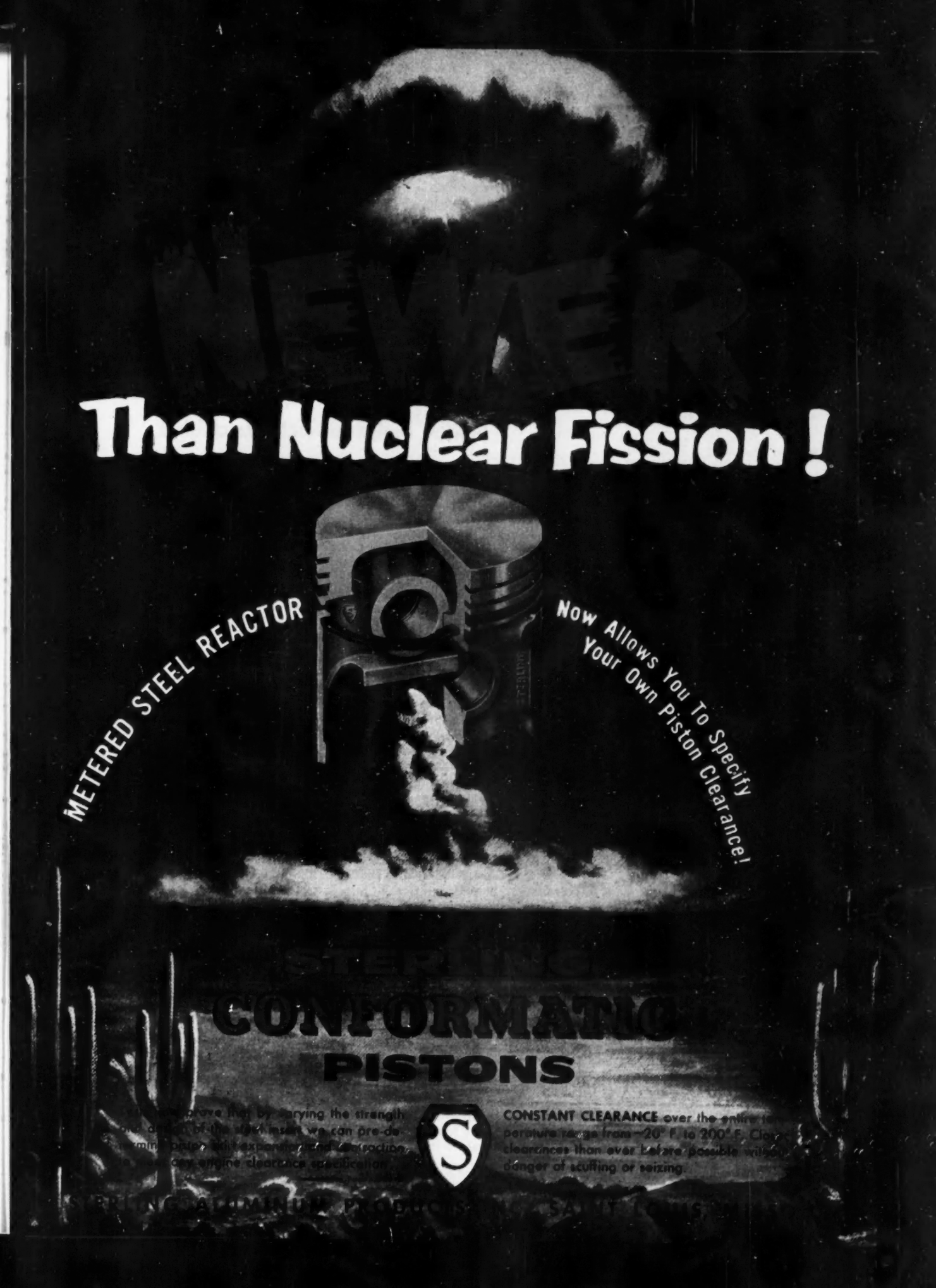
Inside carrying space is increased by rear doors only one-inch thick. In spite of this thinness they are said to be exceptionally strong, being braced on the inside with diagonal hat-shaped aluminum braces giving box type support.

Overall length is further decreased by specially designed door hinges and hardware which have been reduced to only one and one-half inches, thus allowing increased cubeage on the inside.

It is possible to change all of this hardware without dismantling the doors. The doors have a flexible Vinyl plastic seal. This seal is held in place by a riveted metal retainer strip which can be readily replaced if ever necessary. This seal completely encloses the opening all the way around the doors, excluding moisture and dust.

There are 93 in. of inside width, out of a possible 96 in. of legal width. This has been acomplished by the use of sidewalls which are only one and one-quarter inches thick. The outer corrugations come within one-quarter-inch of the outer edge of the rubrail. The thin side walls have been achieved without sacrifice of strength by over-lapping every third corrugation

(*Turn to page* 120, *please*)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CALENDAR

OF COMING SHOWS AND MEETINGS

Mobilgas Economy Run, Los Angeles to Sun Valley, Idaho ..April 5-7

American Society of Lubrication Engineers, annual meeting and exhibit, Netherland-Plaza Hotel, Cincinnati, O. .....April 5-7

National Packaging Exhibition, Convention Hall, Atlantic City, N. J. .....April 5-8

Easter Parade of Stars Automobile Show, Waldorf-Astoria Hotel, New York, N. Y. .....April 6-11

SAE National Aeronautic Meeting, Statler Hotel, New York, N. Y. .....April 12-15

Material Handling Institute, spring meeting, Drake Hotel, Chicago, Ill. .....April 13

Society for Experimental Stress Analysis, spring meeting, Netherlands Plaza Hotel, Cincinnati, O. .....April 14-16

American Zinc Institute, annual meeting, Hotel Statler, St. Louis, Mo. .....April 20-21

International Motor Show, Turin, Italy .....April 21-May 2

Lyons International Fair, Lyons, France .....April 24-May 3

Metal Powder Show and Annual Meeting, Drake Hotel, Chicago, Ill. .....April 26-28

AMA Conference on Management, Hotel Statler, Cleveland, O. April 26-28

ASTE Industrial Exposition, Philadelphia, Pa. .....April 26-30

British Industries Fair, London and Birmingham, England .....May 3-14

American Welding Society, spring technical meeting, Hotel Statler, Buffalo, N. Y. .....May 4-7

International Aviation Trade Show, New York, N. Y. .....May 5-7

National Machine Tool Builders' Association, spring meeting, Edgewater Beach Hotel, Chicago, Ill. .....May 6-7

Annual Foundry Congress and Show, Cleveland, Ohio .....May 8-14

Vickers Production Machine Tool Forum, Park Shelton Hotel, Detroit, Mich. .....May 11-12

Basic Materials Exposition, Chicago, Ill. .....May 17-20

Indianapolis 500-Mile Race, Indianapolis, Ind. .....May 31

Canadian International Trade Fair, Toronto, Canada ....May 31-June 11

SAE Summer Meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J. .....June 6-11

Society of the Plastics Industry, Sixth National Exposition, Cleveland, O. .....June 7-11

Le Mans 24-Hour Race, Le Mans, France .....June 12-13

American Society for Testing Materials, annual meeting, Sherman Hotel, Chicago, Ill. .....June 13-18

SAE West Coast Meeting, Los Angeles, Calif. .....Aug. 16-18

ON OUR WASHINGTON WIRE

Domestic machine tool shipments in 1954 may run between $100 million and $200 million more than had earlier been estimated by either industry or the Government. Industry sources in Washington, basing their estimate on sales for the first two months of 1954, figure the total for the year may well run around $800 million. Government men are even more hopeful. As U. S. Commerce Dept. officials now see it, there is no apparent reason why shipments by the industry this year will not add up to more than $1 billion.

Smaller production of GR-S synthetic rubber is planned by Reconstruction Finance Corp. for the second quarter, as compared with first-quarter output. Reduced demand for the synthetic material is given as the reason.

Muffler Design for Trucks Established

(*Continued from page* 63)

the AMA committee said, is its use of commercially available instruments. These include a high-quality Magnecord magnetic tape recorder and microphone, a set of octave filters, and means for acoustical calibration.

The proposed design standard calls for a maximum noise level of 125 sones, with the sones measured in each of eight bands covering the frequency range from 37 to 9600 cycles per second, then added to produce the total of 125 or less.

The AMA committee pointed out that truck manufacturers have made significant advances in muffler design in recent years, but expressed a belief that adoption now of a standard method of measuring results would help stimulate further progress. At the same time, the committee emphasized that other promising methods of noise measurement may, when thoroughly tested, provide an even better standard. Such possibilities will not be overlooked, it said.

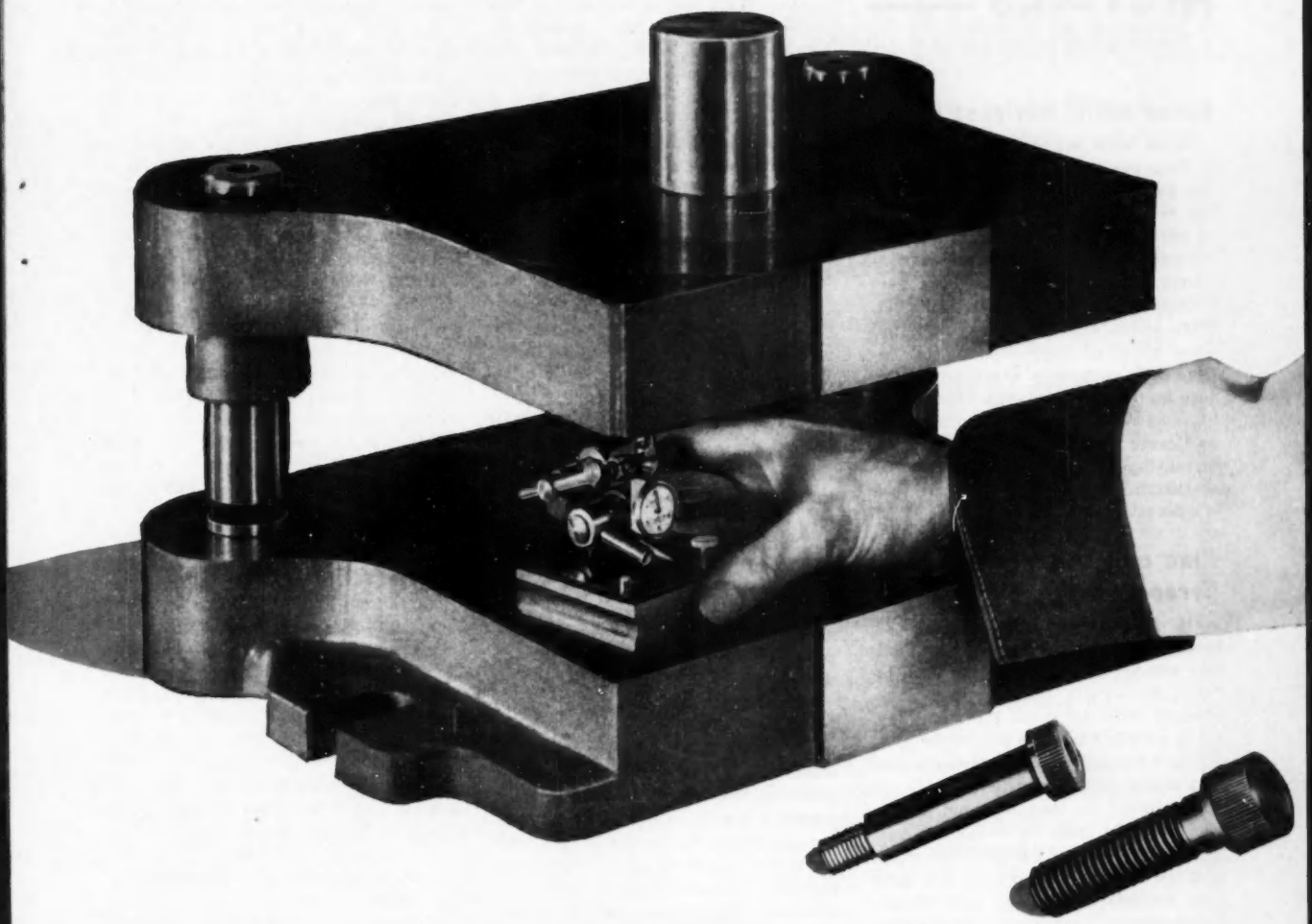
The Truck Noise Subcommittee, whose chairman is David G. Apps, head of the Noise and Vibration Laboratory at General Motors Proving Ground, has prepared a brochure which explains evaluation of truck noise by the Beranek-Armour method.

Briefly, this evaluation consists of recording the noise on the Magnecord recorder as the truck passes by under load. The noise thus recorded is played back through a set of octave bandpass filters. The sound level reading of each band is recorded and plotted on the Armour grid. From this grid, the loudness in sones for each of the filter settings is read off and the individual readings summed up for a single loudness reading for the truck.

The procedure to be used for vehicle operation, microphone location, etc., is that proposed by the SAE Traffic Noise Subcommittee. As a preliminary step, the vehicle noise should be observed under varying operating conditions to determine the condition which produces maximum noise. In general, it is to be expected that this will be found at full throttle near maximum engine speed. However, if there is an obvious exhaust system resonance at a certain engine speed, noise should probably be evaluated at this speed as well. Vehicle speed is considered to be of no consequence. A suitable load can be imposed while operating on the level, using a towing dynamometer, or by operating on a grade.

The microphone should be located five ft above the ground and 50 ft from the center of the traffic lane used by the vehicle. Where this distance cannot be obtained, correction can be obtained by the inverse square law for working distances between 30 and 80 ft, and applied to the levels obtained during playback. No large reflecting surface such as a signboard or hillside should be located within 100 ft of either truck or microphone.

Ambient noise level in each band (due to other sources) should be at least 10 db lower than the level of the test vehicle in the corresponding band. In lieu of a direct method for determining whether this condition is being met, it is best to operate at a place and time where other noises are obviously and definitely not adding significantly to the truck noise.



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METALS

(*Continued from page 94*)

Brass Mills' Business Off

Brass mills report no improvement in their business over the low level of the past few months. Their incoming orders are reported to be about 45 per cent lower than a year ago, admittedly a boom year for the brass industry. Price cutting has been persistent and the end isn't in sight yet. Wire mills, on the other hand, find some signs of improvement and believe their customers' inventories have been quite well liquidated. Significantly, some of the larger brass mills, such as Revere and Bridgeport, are giving increasing attention to fabrication of aluminum products which may be competitive with brass.

Zinc and Lead Prices Strengthen

On March 9 the lead price was boosted ¼ cent per lb and the next day another ¼ cent, bringing it to 13 cents, its price in January. Not to be outdone, zinc advanced the same day by ⅛ cent to 9¾ cents per lb, the first upward change in the market since last September.

The boost in lead was not unexpected by the trade as consumers had been in the market for good tonnages and the seasonal upturn for the battery manufacturers was just ahead. Furthermore, consumer inventories were known to have been pretty well liquidated. Stronger lead prices in London were also a factor and on the N. Y. Commodity Exchange lead futures had advanced appreciably. The stage was set for a price increase.

It was different for zinc. The February statistics showed zinc stocks in producers' hands to be just under 200,000 tons, highest figure for a decade. Buyers were fully aware there was plenty of zinc to be had by picking up the telephone and while business had been a trifle better, it left much to be desired. Hence the ⅛ cent increase caught most buyers by surprise.

Perhaps sufficient weight had not been given to the sharp curtailment in smelter production announced during the month which totals over 14,000 tons, or about 18 per cent of normal monthly output. This is almost certain to reduce producers' top heavy unsold stocks and to bring demand and supply into closer balance. Undeniably the current zinc price, even with the increase, brings little or no profit to even the lowest cost producers. This was admitted by New Jersey Zinc Co. in a statement accompanying its latest dividend, that continuance could not be assumed unless there was improvement in the zinc price.

Both zinc and lead producers are hopeful of some kind of relief through Congressional action. This may take the form of higher tariffs, subsidies, or Government buying surplus metal for the stockpile. It is virtually certain that any announcement to that effect would be followed promptly by an upturn in price as domestic consumers hastened to replenish inventories.

Tin Prices Advance Sharply

Tin rose sharply in New York and London following the announcement that Washington would not sell 40,000 tons of surplus tin on the open market and while unwilling to become a signatory of the new tin cartel—more euphemistically called agreement—it would maintain a sort of benevolent neutrality, recognizing that it would probably benefit Far Eastern producers in a critical time.

Under the terms of the agreement buffer stocks will be created through which it is expected to control the market price between limits of 80 cents and a $1.10 per lb. Export quotas will also be set up for producing countries. The original tin cartel worked well in the pre-war period and satisfied producers and consumers tolerably, and perhaps the new agreement will have equal luck.

Left to an open market it is almost certain that the price of tin would sag much below 85 cents per lb as world production has exceeded consumption for several years. While this might be of immediate benefit to American consumers it might prove to be paying too high a price if it resulted in playing directly into Communistic influences in the Far East, source of nearly all the world's tin mines.

SAE Meeting

(*Continued from page 55*)

the present time because the finishes are lacking in gloss, flow, and hardness.

The passenger car tire is intimately involved in the so-called car stability, and S. A. Lippman, U. S. Rubber Co., presented a method developed there to rate stability. This involves an oscillograph for recording the lateral acceleration of the car in the driver's location in relation to the torque and steering angle applied by the driver. Mr. Lippman discussed the psychology of the self-adjusting system composed of the driver and the car, and pointed out the time lag between maximum steering effort, and maximum wheel angle and lateral acceleration. He presented oscillograph traces of cornering force versus slip angle for various road speeds, simulated on a dynamometer roll where the car is restrained to front and lateral travel only. In the discussion it was brought out that stability factors include tread pattern, width, and flatness, and rim width. A slight change in the cord angle, plus or minus two degrees, was said to affect riding qualities too drastically to be of value in improved stability. Full cornering force was said to be developed within 1½ ft at any speed according to one discusser.

At perhaps the best-attended section of the meeting, car shake was investigated in a symposium of six papers. Outlining the effect of the suspension system on shake, R. R. Peterson, of Chrysler Corp., discussed the suspension as a high-frequency filter and shake exciter. A comparison of the structural values of various cars, including four-door sedans and convertibles, was reported by Mark Garlick, Pontiac Motor Div. Investigations of flexible engine mountings made at Packard Motor Car Co. were reported by L. H. Frailing. He pointed out examples of car shake abetted by engine mountings tuned too close to the wheel hop frequency. Various attacks on the ever-present shake problem on convertibles were outlined in a paper by M. Kamins and W. B. Love, Studebaker Corp. One test showed that improved door fastenings, although increasing the torsional stiffness of the body, made only a small shake improvement. An electronic computer to count the number of vibrations above a certain threshold value at various points around a test car was described by R. J. Saxon, of Ford Motor Co. The instrumentation and test procedure for simulating car shake in the laboratory were discussed by Max Ruegg, General Motors Corp. He discussed examples of particular problems which were solved by this method and which were found to be in good agreement with road observations.

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Trouble Shooting By Parts Makers

(*Continued from page 67*)

and a load is applied. Temperatures both of the specimen and the furnace are recorded by use of thermocouples. With this arrangement, all engine variables except exhaust gas atmosphere can be controlled to obtain comparative data on materials.

Another device developed by Thompson engineers is the thermal fatigue test rig, designed to bypass the usually long, expensive engine test program required to obtain comparative data and to duplicate this type of failure in a laboratory bench apparatus.

In this device, the valve is alternately heated by an induction coil and cooled by a water-cooled seat. Any temperature pattern can be produced by varying the time cycle for heating and cooling, and the shape of the induction coil. Thermal fatigue can be obtained in a few minutes in this rig by producing drastic temperature differentials during the heating and cooling cycle, there being a striking similarity between the thermal fatigue failures produced by this rig and those produced in service. There is still a new tool in the study of valve alloys and while correlation with field test results are encouraging, much remains to be learned about it.

Instrumentation also has been developed to obtain the necessary information on tappet lash characteristics. A coil section of a small transformer is clamped to the base of the pushrod, while the core rides on the edge of the tappet body. With this arrangement relative motion between the tappet plunger and body produces a corresponding motion of the transformer core. Transformer design is such that an electrical signal is produced, directly proportional to the distance the core moves, the accompanying circuitry being so arranged that the motion of the core is recorded on the Y axis of the oscilloscope, while the sweep of X axis is triggered by a flywheel stud and represents the rotational position of the cam. Other electronic equipment includes a signal generator and amplifier for transformer input, and a rectifier and filter to condition transformer output for oscilloscope interpretation.

Another major contribution is the installation of an electronic computer which is used in the solution of many engineering problems. An example of the type of problem which can be solved is the "Polydyne" method of cam design. This method, which has recently been advanced by Thompson Products' engineers, used polynomial equations to define the cam contour and the accommodation in the contour of factors which offset the dynamic characteristics of the cam and follower system. The basic concepts of this method have proved successful in the field and are potentially well adapted to all cams requiring control of kinematic properties.

American Brakeblok Div., one of 10 divisions of the American Brake Shoe Co., is concerned primarily with the friction materials required for the gamut of applications in the automotive industries. Until recently research and product engineering facilities of the division were located in Detroit. However, within the past year

(*Turn to page 106, please*)

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THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud *has* to be right—every feature *is*. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

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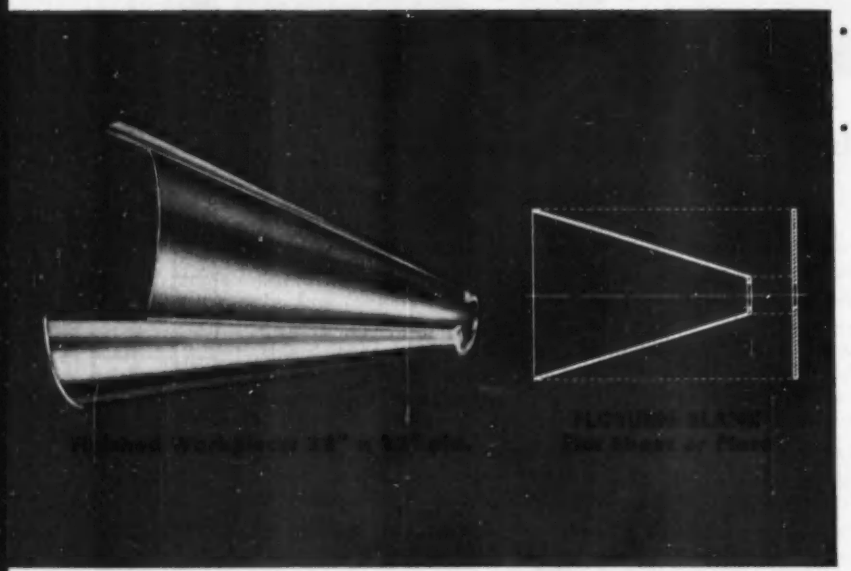
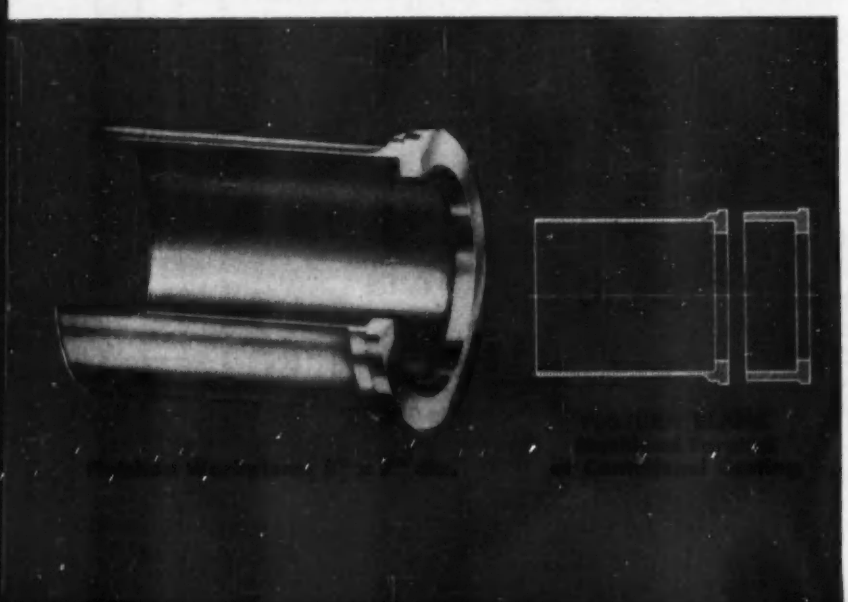


...AXIALLY ROLLS SIMPLE BLANKS INTO COMPLEX FORMS.

...DISPLACES METAL BY COLD FLOWING.

FLOTURN is a completely new process originated by Lodge & Shipley. FLOTURN offers startling advantages and economies in precision metal forming at production rates with low-cost tooling. If you are now producing conical or cylindrical parts by conventional drawing, welding, or machining methods FLOTURN may offer you amazing savings in time, materials and tooling! FLOTURN equipment or subcontract service is available only through Lodge & Shipley and its distributors.



HOW FLOTURN WORKS

. . . the FLOTURN process starts with either a simple flat blank, machined blank, machined forging, drawn cup, wrapped and welded cylinder or centrifugal casting.

. . . FLOTURN equipment scientifically applies great pressure against the blank, causes the metal to flow in a cold state. Pressure is spirally applied continuously, flowing the metal to the shape of a mandrel.

FLOTURN IS HIGHLY ACCURATE

. . . wall sections of work are uniform, predetermined, with never changing thickness and can be easily held to $\pm$.002".

COPYRIGHT THE LODGE & SHIPLEY CO. 1954

METALWORKING'S NEWEST PRECISION PROCESS

FLOTURN*

an Exclusive and Revolutionary Development in Metal Forming

...ELIMINATES MANY MACHINING, WELDING, DEEP DRAWING OPERATIONS.

...SAVES COSTLY MATERIALS...TIME AND TOOLING OF CONVENTIONAL METHODS.

...PRODUCES FORMS FROM EVEN NEWEST ALLOYS DIFFICULT TO MACHINE.

...ADDS STRENGTH AND HARDNESS TO FINISHED WORK.

FLOTURN SAVES TIME, MATERIALS, TOOLING

... The FLOTURN blank weighs the same or slightly more than the finished part.

Here is how FLOTURN saves on material alone. To produce identical parts, the old forging-machining method required a 369-lb. blank; the FLOTURN method required only a 65-lb. flat blank. Finished weight of both was 50-lb. FLOTURN savings on material alone 82½%!

... FLOTURN tooling is low in cost—only about 1/10 the cost of deep draw dies, for example. Tooling life is long.

FLOTURN FOR A WIDE RANGE OF METALS

... these materials have been formed successfully with FLOTURN:

- ... Steel ... sheet, plate, bar stock or forgings
- ... All 300 and 400 series of stainless steel
- ... Timken 16-25-6 and 17-225
- ... Haynes Multimet
- ... Universal Cyclops Uniloy 19-9
- ... Inconel and Inconel-X
- ... Monel and K-Monel
- ... Titanium T1-140-A

FLOTURN ADDS STRENGTH AND HARDNESS

... in direct contrast to drawing, FLOTURN increases part strength. For example, in working 302 stainless: *tensile strength increased as much as 100%. After stress relief, 40% of increase was retained. Hardness increased from cold roll annealled to* 57-59R_{30N}

DIFFICULT SHAPES ... FAST ... BY FLOTURN

... Conical, cylindrical, combination of the two and other complex shapes are easily formed by FLOTURN. Tooling for any shape is low cost compared to conventional means.

... FLOTURN plus machining produces parts considered impractical before. Existing jobs are done faster, easier, at lower cost. Finished parts are stronger.

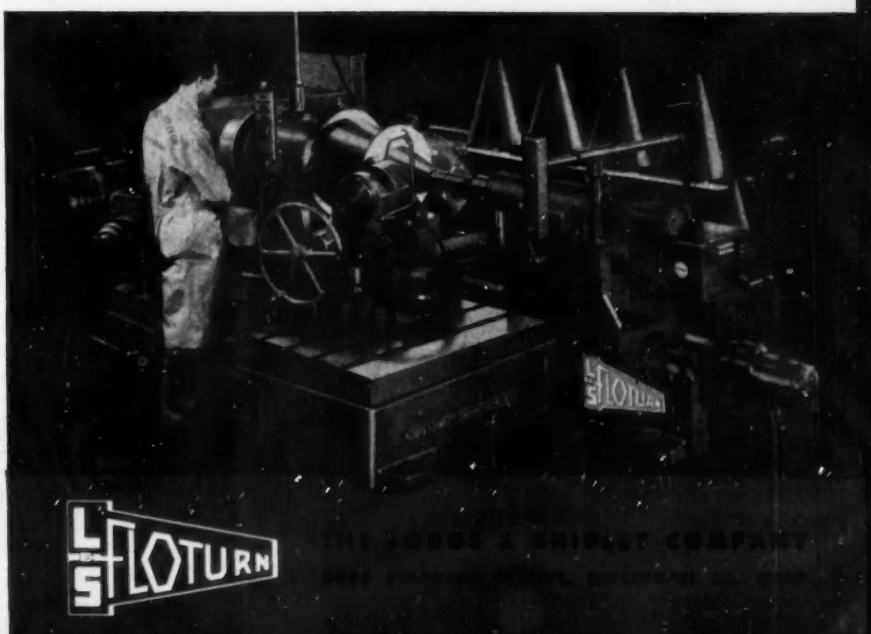
FLOTURN EQUIPMENT OR SUBCONTRACT SERVICE

Standard FLOTURN Lathes handle blanks 5/16" in thickness, 42" in diameter and 24" long on the No. 40 x 24" FLOTURN Lathe. Similar work up to 50" long can be handled on the No. 40 x 50" machine. Larger work may be handled on special FLOTURN equipment.

Lodge & Shipley sells FLOTURN equipment or will produce your parts on contract.

COMPLETE FLOTURN DETAILS ON REQUEST

... the FLOTURN process has been described in detail in leading publications. Send for reprints and complete literature on this exclusive Lodge & Shipley equipment and process.



*T/M THE LODGE & SHIPLEY CO. 1954

Vinco Spline Gage Engineers Can Locate and Correct Your Spline Gaging Troubles as Expertly as a Navigator Can Determine a Ship's Position

The needless loss of time and money, caused by splined parts not being interchangeable or failing in operation, is amazing. If this is happening to you, don't hesitate, call in a Vinco spline gage specialist. You will discover, as have so many other successful manufacturers, that the recommended corrective measures will clear up gaging confusion and reduce production, assembly and service problems. Such programs improve quality and reduce costs! In practically every case they have more than paid for themselves—proof that a specialist IS your best bet.

Vinco Corp., 9117 Schaefer Hwy., Detroit 28, Mich.

We'll see you in booth 121 at the A.S.T.E. Exposition

VINCO

MILLIONTHS OF AN INCH FOR SALE

Gear Pumps • Master Gears • Commercial Gears
B-1 Formed Wheel Dressers • Spline Gages
Optical Master Inspection Dividing Heads
Camshaft Comparators • Involute Checkers
Precisiondex • Gear Rolling Inspection Fixtures

TRADEMARK OF DEPENDABILITY ®

Parts Makers

(*Continued from page* 102)

all of these facilities were moved to Mahwah, N. J., which now forms the center of research for all divisions of the parent company. By this means the research talent and facilities of the entire group are at the disposal of each of the cooperating divisions.

Some 50 people are engaged at this new research center on the study of problems involved in the development and testing of friction materials. The Mahwah center has complete chemical and physical testing laboratories, a fully equipped pilot plant, friction machines and dynamometers for testing the various formulations under the wide range of conditions circumscribing the use of heavy duty friction linings. The technicians engaged in this continuing project are skilled in the problems of heat, wear, and friction; and are constantly at work on basic research involving fibers, resins, fillers, and other ingredients of brake linings.

As new heat and abrasion resistant fibers, bonds, and fillers are developed by the research staff, the pilot plant is alert to develop the new manufacturing techniques and special equipment for the production of approved products. Thus the new methods are studied and perfected before the program is released for mass production.

It is important to note that testing of friction materials is not confined to the laboratory. American Brakeblok has been operating a field test program in the Pennsylvania mountains since 1926, including the now famous Jennerstown test for accelerated wear. Today the division operates a fleet of modern passenger cars and trucks out of garage centers at Jennerstown and Toms River.

These vehicles are equipped with special instrumentation and recording devices and are driven according to prescribed test procedures. One of the latest of the test techniques developed by the division is the continuous recording of temperature on all braking surfaces. In addition, other test data such as braking pressure, deceleration rates, and stopping distances are simultaneously recorded. With this new instrumentation it is possible to pattern the procedure so as to closely simulate any prescribed brake application as well as to determine by recorded cross country runs conditions found in actual service.

American Brakeblok thus exemplifies the true role of the supplier to the industry not only in the development of new materials but in the

REBORN EVERY YEAR

from the Gay Nineties to the Automotive Fifties

In 1900—The old time mixing valve was replaced by SCHEBLER CARBURETORS.

In 1903—The Spur type Differential was introduced by WARNER GEAR. Radiators made of copper tubing with attached cooling fins introduced by LONG.

In 1913—The Single Plate Clutch was developed by BORG & BECK and Silent Timing Chains were introduced by MORSE CHAIN.

In 1916—Universal Joints were developed by MECHANICS.

In 1921—First standard type Transmissions were introduced by WARNER GEAR.

In 1922—Double Plate Clutches were introduced by LONG.

In 1923—Multiple Spring Clutches developed by ROCKFORD.

In 1924—Vibration Dampening Flexible Center Clutches introduced by BORG & BECK.

In 1930—Transmission Synchronizer Units for Cars and Trucks produced by WARNER GEAR.

In 1931—Roller Bearing Universal Joints introduced by MECHANICS. Free Wheeling offered to the industry by WARNER GEAR. Tapered Steel Discs for truck wheels were developed by INGERSOLL.

In 1934—Automatic Overdrives for Transmissions were introduced by WARNER GEAR.

In 1938—Borglite and Torbend Clutch Plates were introduced by BORG & BECK, LONG, and ROCKFORD.

In 1939—Ty-Ply Rubber-to-Metal Bonding material developed by MARBON.

In 1949—Automatic Transmissions were perfected by DETROIT GEAR and WARNER GEAR.

In 1952—MARVEL-SCHEBLER introduced Power Chambers and Hydraulic Power Units for trucks and trailers; LPG Carburetion Systems for trucks, tractors, buses, taxis and stationary engines.

What other industry has imposed on itself so consistently the responsibility for producing new models, better than ever, every year? Certainly none ever set for itself such a pace of self-improvement. Automotive engineers long ago accepted the challenge continually to develop new features of safety, performance and comfort—and it has paid off in continuing public approval. This annual rebirth of youthful vitality has given this fast-growing industry amazing virility and strength.

Organized primarily to serve the automotive industry, Borg-Warner has always accepted the urgency of constant improvement—with the result that today, *of 20 makes of passenger cars available*, 19 employ essential parts of B-W manufacture. This record has been achieved by constant cooperation with car builders since "the old days" when the industry was born.

B-W engineering combined with B-W production will continue to justify your faith in us and in the future of the entire automotive industry.

Roy D. Ingersoll
President
BORG-WARNER CORPORATION

BORG-WARNER

ENGINEERING B-W PRODUCTION

THESE UNITS FORM BORG-WARNER, *Executive Offices, Chicago:* ATKINS SAW • BORG & BECK BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • CLEVELAND COMMUTATOR • DETROIT GEAR • FRANKLIN STEEL • INGERSOLL PRODUCTS • INGERSOLL STEEL LONG MANUFACTURING • LONG MANUFACTURING CO., LTD. • MARBON • MARVEL-SCHEBLER PRODUCTS • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • MORSE CHAIN CO., LTD. • NORGE NORGE HEAT • PESCO PRODUCTS • REFLECTAL • ROCKFORD CLUTCH • SPRING DIVISION WARNER AUTOMOTIVE PARTS • WARNER GEAR • WARNER GEAR CO., LTD. • WOOSTER DIVISION

MARKEM SOLVED THIS MARKING PROBLEM

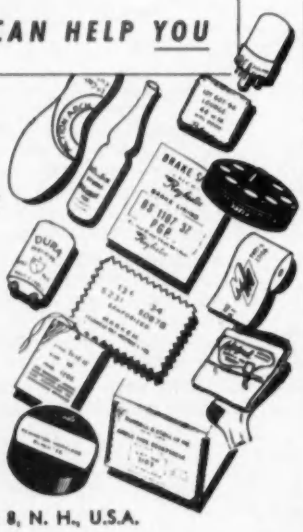
IMPROVED PRODUCT APPEARANCE —LOWER PRODUCTION COSTS

A manufacturer of wood screws increased his product's retail merchandising appeal by changing from cardboard boxes to plastic tube containers which clearly display the screws. He now prints all label data directly on the cylindrical container with a Markem machine. Quickly changed variables in imprints include: quantity, type of plating, head type, length and size. Containers are imprinted as and when needed; no inventory of marked containers need be maintained. The method eliminated outside printing changes, tremendous paper label inventories, and labor of label application. One Markem machine, printing at production rates in exact quantities, has made possible the more attractive and appealing package and at the same time reduced production costs appreciably.

THE MARKEM METHOD CAN HELP YOU

This is just an example of how Markem solves industry's marking problems. The complete Markem Method consists of: (1) *ANALYSIS of your marking or imprinting problems,* (2) *RECOMMENDATION of appropriate Markem Machine, Markem Type and Markem Ink, and* (3) *SERVICE—in installation, instruction, maintenance and supply.*

If you want to mark products, parts or packages for identification, control or market, get in touch with Markem. The Markem Method has been providing a single source for savings in time, effort and inventory . . . since 1911.



Markem Machine Company, Keene 8, N. H., U.S.A.

MARKEM ...TO MAKE YOUR MARK

laboratory and field testing of these products in modern vehicles under actual service conditions.

American Bosch Corp.—Considered to be one of the leading independent manufacturers of Diesel injection pumps and nozzles, the company supplies a variety of equipment for the automotive industries and is recognized as a specialist in the field of electrical equipment. It has long range plans for the continued development of specialized small motors; and the further development of fuel injection equipment, including distributor type pumps for automotive Diesels. It is of interest too that work is being done on a low cost gasoline injection system for motor cars long awaited by the industry.

Among the parts supplied by this company are the following: electric windshield wipers for cars and trucks; electric motors of small size but relatively high power for window, top, and seat actuation, as well as for axle shifting mechanism; heavy-duty special purpose generators and regulators; voltage regulators; magnetos for industrial engines; magnetos and starting vibrators for aviation and tank engines; ignition coils; fuel injection pumps; injection nozzles; speed and torque control governors; feeding pumps for ABC injection pumps; final stage fuel filters.

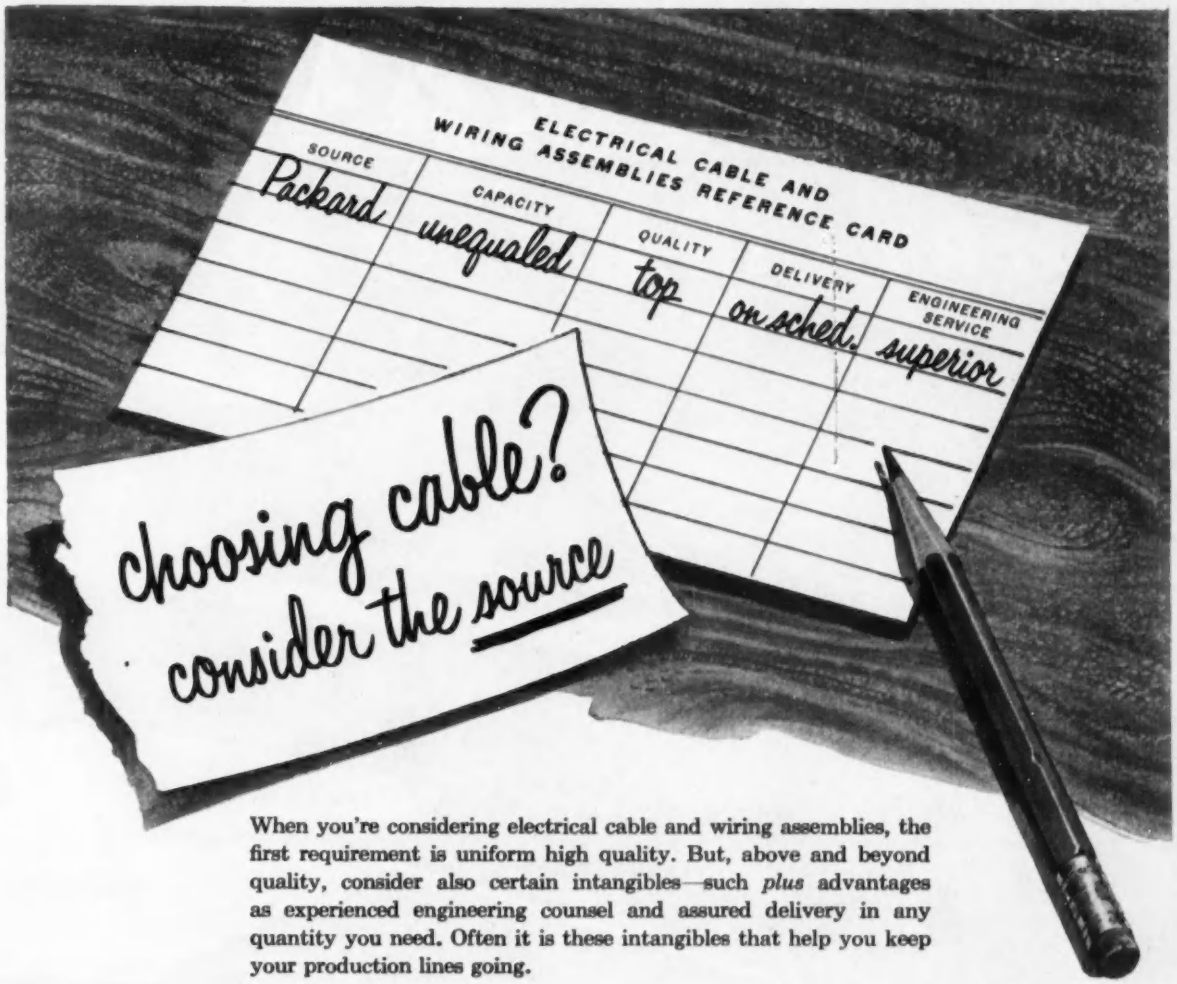
The company is engaged in a continuous program of product improvement and development, some of the most noteworthy projects being summarized below. For example, ABC has just released for field testing its type PDA fuel injection pump. Suitable for distributor drive mounting as well as conventional flange mounting, it is but a little larger than a typical ignition distributor. It incorporates a fuel supply pump as well as an integral mechanical governor. This pump is expected to contribute to the increased use of small Diesel engines.

In addition to the introduction of its line of small electric motors for the power operated mechanism of motor cars, ABC has also developed small starting motors for outboard motors and small engines.

Long an exponent of electric windshield wipers, the company has recently developed an electric wiper incorporating a depressed parking principle. When at rest the wiper blade is parked off the windshield surface against the edge molding of the glass.

ABC also is engaged in the jet engine field, and has introduced two different jet engine ignition systems

(*Turn to page* 113, *please*)



When you're considering electrical cable and wiring assemblies, the first requirement is uniform high quality. But, above and beyond quality, consider also certain intangibles—such *plus* advantages as experienced engineering counsel and assured delivery in any quantity you need. Often it is these intangibles that help you keep your production lines going.

Consider Packard as a source

Product *quality*? The wide choice of Packard, by America's foremost manufacturers of automotive vehicles, aircraft and appliances, is your answer.

Capacity and delivery? Packard is equipped to produce more than 7,000,000 feet of finished cable, and 800,000 wiring assemblies, *daily* . . . and to maintain delivery schedules unfailingly.

Engineering service? A large staff of Packard engineers is ready to serve you at any time, at any place. Call on them—the earlier, the better, preferably while your new product or model is still on the drafting board. Our engineering counsel has often effected important savings in assembly costs.

Packard

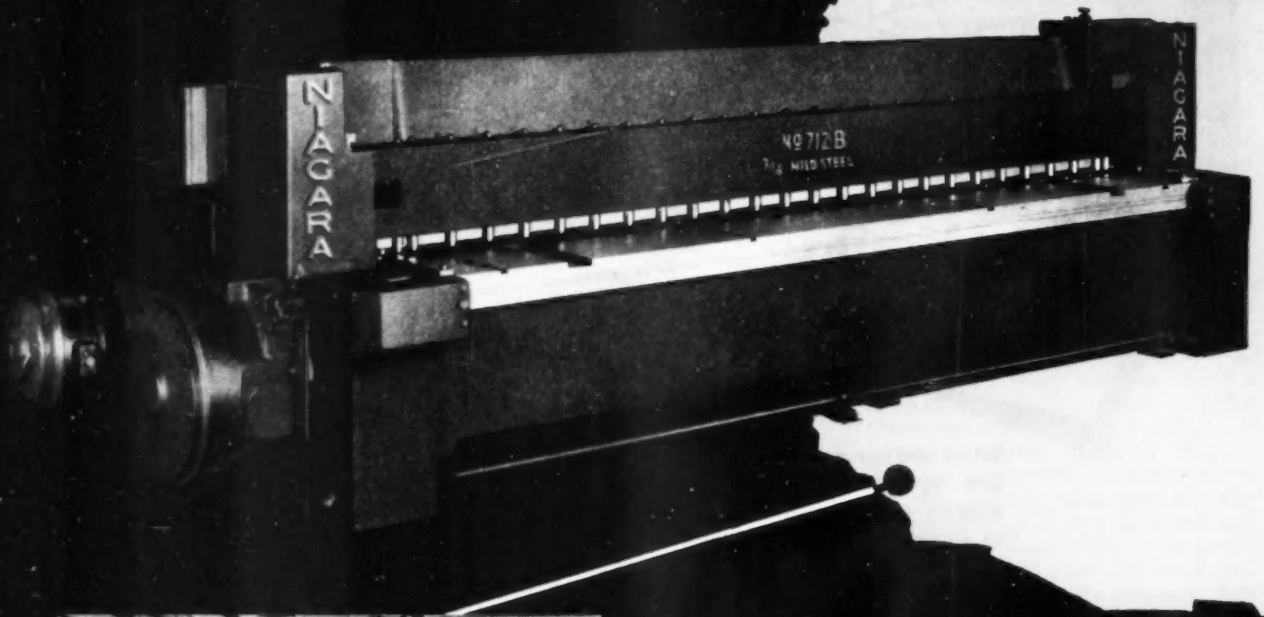
REG. U.S. PAT. OFF.

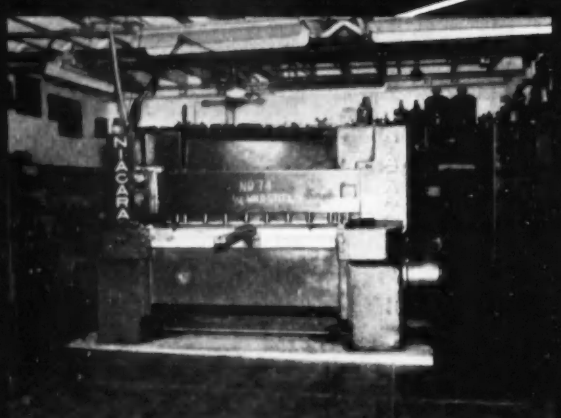
Packard Electric Division • General Motors Corporation • Warren, Ohio

AUTOMOTIVE, AVIATION AND APPLIANCE WIRING

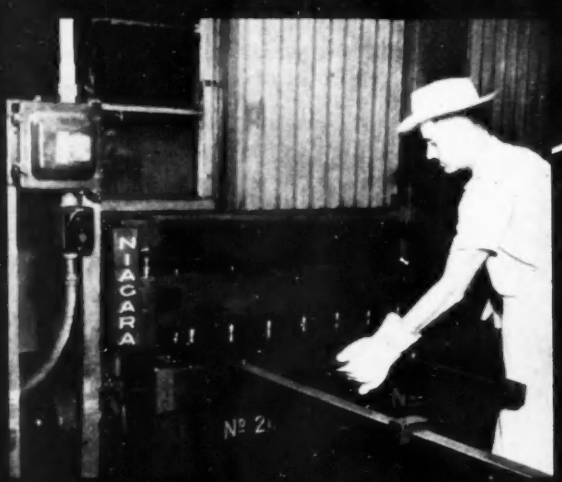
NIAGARA

SERVE INDUSTRY FROM





ELECTRONICS. Cutting .003" molybdenum to within .001" and ¼" copper with no change in set-up at a plant in California

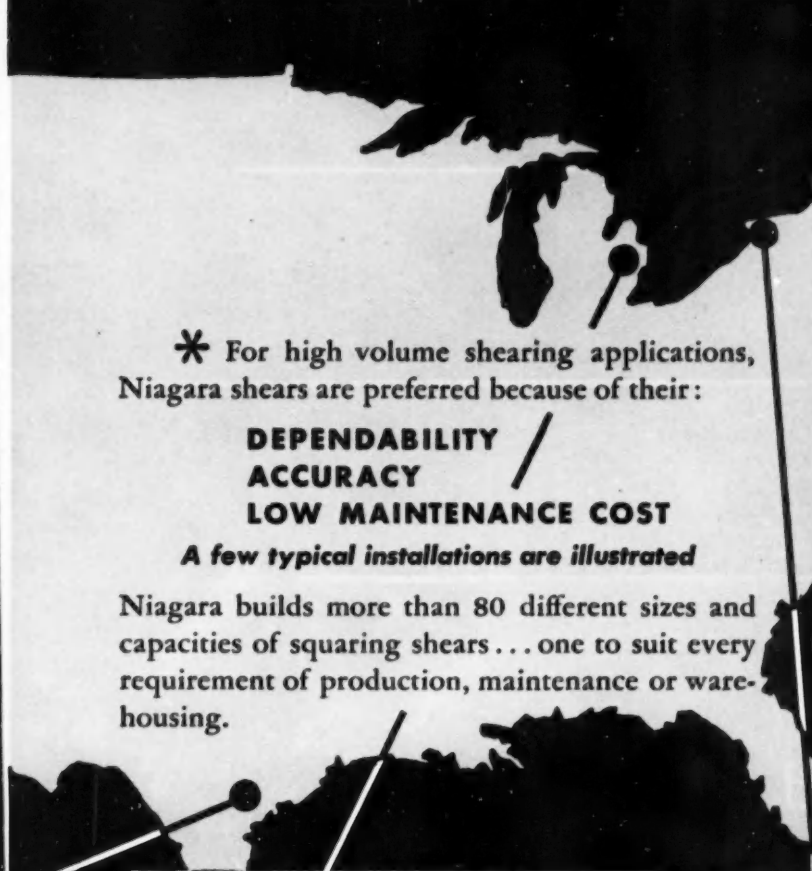


DRUMS. Shearing sheets for drum bodies in Texas

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

SHEARS

COAST TO COAST



* For high volume shearing applications, Niagara shears are preferred because of their:

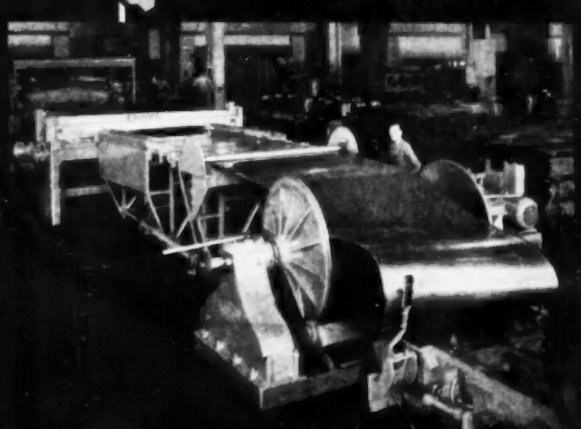
DEPENDABILITY
ACCURACY
LOW MAINTENANCE COST

A few typical installations are illustrated

Niagara builds more than 80 different sizes and capacities of squaring shears . . . one to suit every requirement of production, maintenance or warehousing.

ELEVATORS. Two of seven Niagara Shears in production at a large plant in New Jersey

WAREHOUSE. Shearing thousands of tons of all kinds of steel at a steel warehouse in Michigan

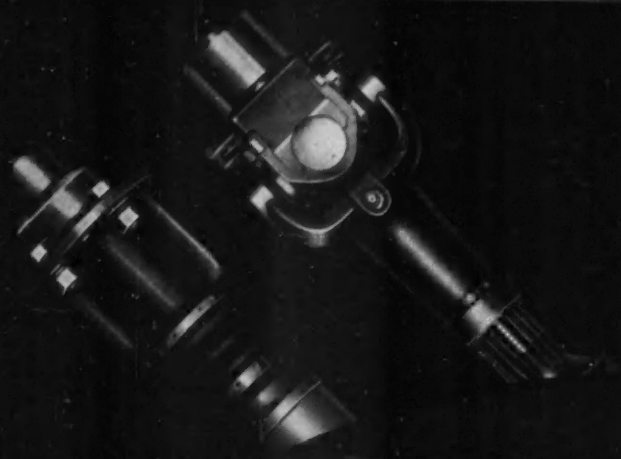


AUTOMOBILES. Continuous operation in a cut off line at a body plant in Western New York

America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

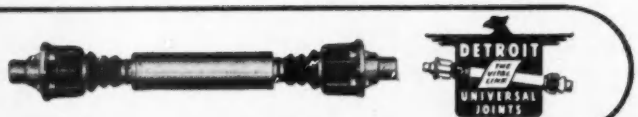


"DETROIT" Universal Joints . . .

. . . Carry the Load for Numerous Types of Vehicles

"DETROIT" Universal Joints have an enviable service record in practically every field of power transmission—cars, trucks, tractors, military vehicles, railroad equipment, mine locomotives, power take-offs and other applications. They *must* be dependable.

DETROIT®
UNIVERSAL JOINTS



UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

(*Continued from page* 108)

—one battery-operated, the other deriving its electrical supply from an accessory drive magneto. The ABC ignition system provides a shower of high energy sparks at temperatures as low as minus 55 F and at altitudes up to 55,000 ft.

Because of the diversity of products an equally wide range of research facilities is maintained at ABC. From the receipt of the raw material to the shipment of the finished product, each step in the design, development and manufacturing processes is under continuous scrutiny to insure top quality.

The Materials Laboratory, aided by the use of a Littrow Prism Spectrograph and ARL densitometer, together with the research type Metalloscope, X-ray equipment, and Tukon micro-hardness tester, carries on continuous research in the control of the physical, chemical, and mechanical properties of engineering materials and processes.

In the Electrical Laboratory a product may be given an insulation test to 150,000 volts; tested for performance on an M-G power supply capable of delivering 4000 amp at 50 volts; checked for operation at 80,000 ft altitude; operated at minus 65 F; certified for radio quietness in the radio-shielded room on instruments covering the range of frequencies from 14,000 to one-billion cycles per second; tested for resistance to resonant torsional vibrations; circuit analyzed on one of the high-speed oscilloscopes; certified for corrosion resistance in the high humidity or salt-spray cabinets; dynamometer tested; plane vibration tested; or put through an endurance program.

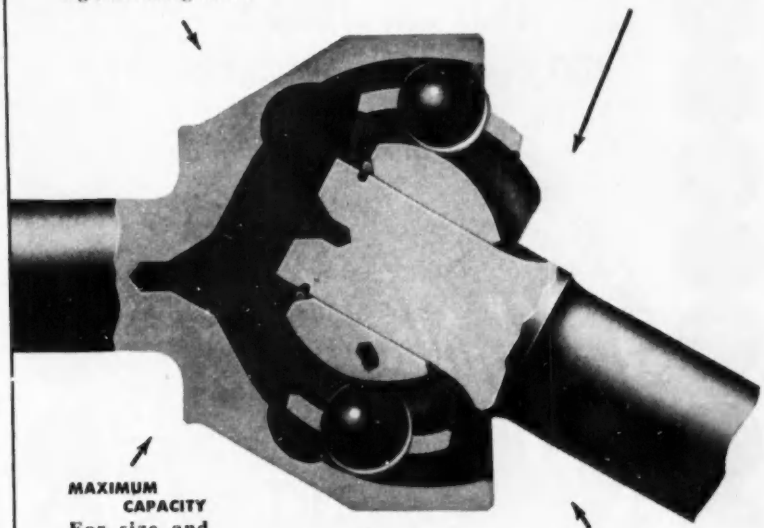
The Fuel Injection Laboratories are equipped to handle all fuels from Iso-octane to the heaviest Diesel fuel oils. Engines are tested and evaluated on 10 dynamometers ranging in size from ¼ to 300 hp, and may be subjected to cold weather operational tests at temperatures as low as minus 40 F. Equipment is in use ranging from that used in the measurement, recording and analysis of hydraulic shock waves to high intensity stroboscopic and camera equipment for the study of transient motions. More than 50 drive stands are installed with power up to 30 hp and capable of test driving speeds up to 8000 rpm. Air-box equipment used in the development of better mixture controls for automotive engines, together with the specialized equipment for the performance evaluation of such engines, rounds out the complete coverage of the engine accessory field.

UNIVERSAL FAVORITE
IN UNIVERSAL JOINTS
-RZEPPA *Constant Velocity*

HERE'S WHY:

CONSTANT VELOCITY
Transmits rotary motion from one shaft to another—uniformly, smoothly. Hardened steel balls roll in grooved raceways, providing true rolling action.

HIGHEST ANGULARITY
Up to 35°! No variation in relative angular velocity is possible.



MAXIMUM CAPACITY
For size and weight, the most rugged performer you can select.

COMPACTNESS
Designed to work in the closest quarters possible. Compare dimensions before you specify any joint.

LONG LIFE
Constant Velocity builds in durability.

These are factors that count! Compare all of them with Rzeppa before you specify any joint. You'll find the very best costs a lot less than you think.

So you may have all the facts and engineering data about Rzeppa's Constant Velocity Joints for immediate and future comparison:

SEND FOR OUR BRAND NEW ILLUSTRATED CATALOG.

RZEPPA
JOINT DIVISION
THE GEAR GRINDING MACHINE COMPANY
3903 Christopher, Detroit 11

Monroe Linkage Type Power Steering

(*Continued from page 71*)

Whereas the current design employs a single, thick-walled seamless steel tube which is purchased with fine finish and close tolerances on the inside diameter, the proposed design has two lighter gage tubes, requiring no special machining. As a matter of fact, the two tubes are produced by Monroe on its Yoder tube mills in the same fashion as they make tubing for shock absorbers.

In this design, the annular space between the two tubes carries the oil to the rear face of the piston, thus eliminating the former external high pressure plumbing line.

Monroe looks for important improvements in oil pumps—or a central power source—capable of supplying oil pressure up to 1500 psi. If and when such equipment becomes available, it will be possible to make the power mechanism still more compact and smaller and may result in installations that do not exceed the weight of conventional linkage.

From the standpoint of advanced practice in materials utilization the company has done some outstanding work with sintered iron powder parts. For example, all shock absorbers have sintered iron pistons and piston rod guides, the pistons having cored holes, thus replacing machined parts.

On the larger sized shock absorbers —2 and 2½ in. sizes—the base valve and piston are of special sintered iron design. By using special presses these parts have a much denser structure and are later infiltrated with copper to further increase density and physical properties.

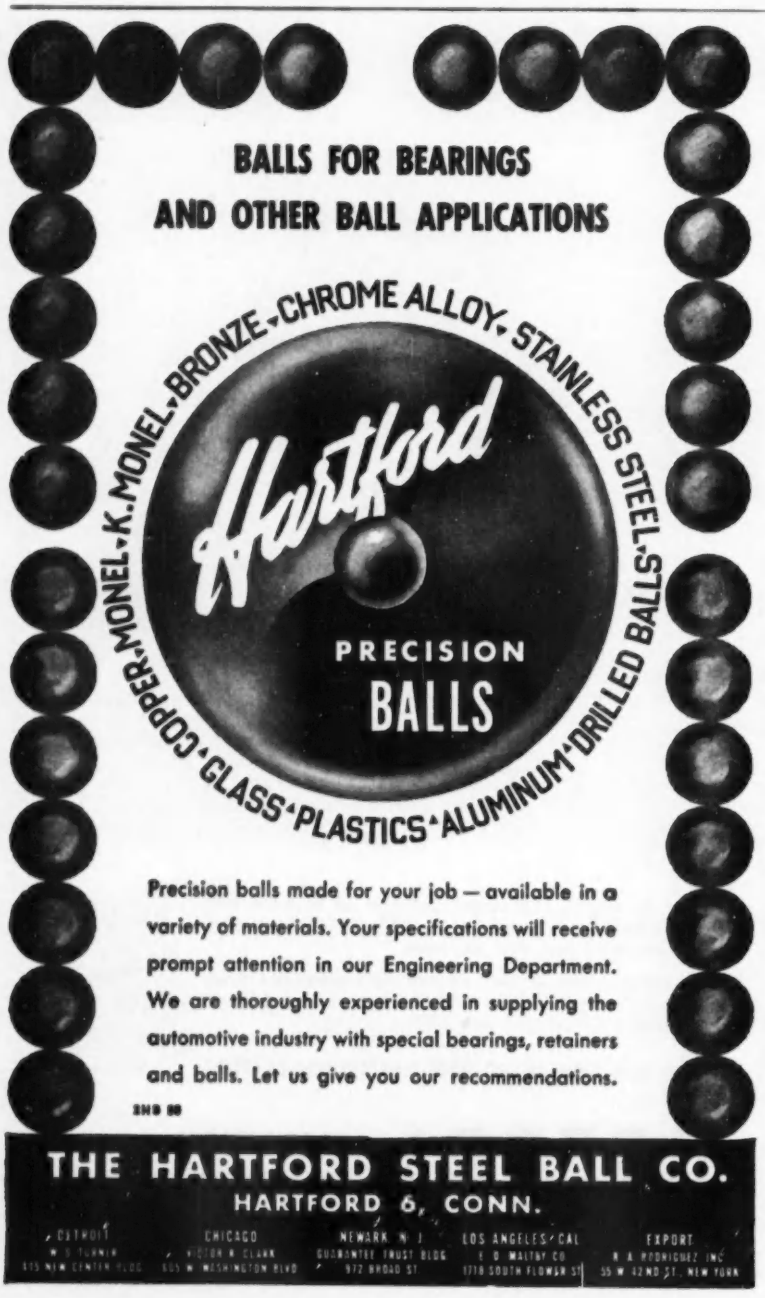
A number of sintered parts are employed in the power steering cylinder of the present line. These include the following: piston, rod guide, ball seats, and pitman race shoe. Because of the requirements of strength and durability, these parts are of dense structure, and infiltrated. In addition, they are heated in a special furnace and subjected to superheated steam at 1050 F, to impart increased physical strength as well as a non-scuffing surface coating.

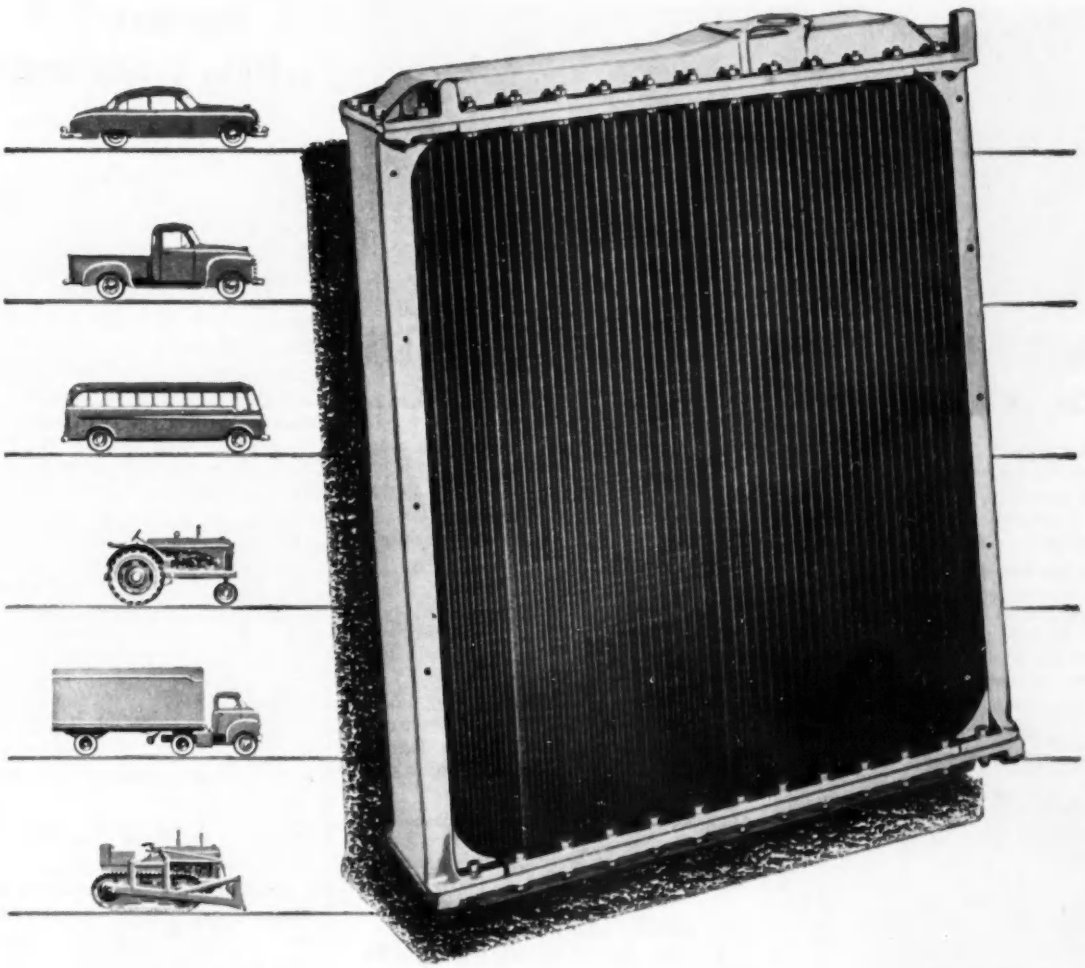
The experimental power steering cylinder assembly employs a sintered piston, rod guide, and ball seats. It eliminates the pitman shoe, replacing the latter with a light stamping.

Monroe sintered parts have been made by the Haller technique, a rather spectacular application being illustrated here. It is one of the military shock absorber bearings which have spherical seats and spherical races, the parts being produced exactly to size and form, and requiring no further machining. They are made of dense sintered iron, infiltrated with copper, then carburized to develop maximum physical properties and hardness.

One of the most noteworthy of these bearings is the part illustrated. Its special feature is the provision of an internal oil well, produced during the fabrication cycle and filled with oil to provide lifetime lubrication. It may be noted, too, that the inner race has two keyways produced in the press and requiring no machining.

It will be seen that the assembly is composed of the inner spherical portion, two spherical races, and some small steel parts. These are fitted together and encased by the stamped outer housing which is staked in place after assembly.


BALLS FOR BEARINGS
AND OTHER BALL APPLICATIONS
COPPER • MONEL • K-MONEL • BRONZE • CHROME ALLOY • STAINLESS STEELS
Hartford
PRECISION
BALLS
GLASS • PLASTICS • ALUMINUM • DRILLED BALLS
Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.
2ND 50
THE HARTFORD STEEL BALL CO.
HARTFORD 6, CONN.
DETROIT
W. D. TURNER
615 NEW CENTER BLDG.
CHICAGO
VICTOR R. CLARK
605 W. WASHINGTON BLVD.
NEWARK N. J.
GUARANTEE TRUST BLDG.
972 BROAD ST.
LOS ANGELES, CAL.
E. O. MAITHY CO.
1718 SOUTH FLOWER ST.
EXPORT
R. A. RODRIGUEZ, INC.
55 W. 42ND ST., NEW YORK



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"balanced cooling"

Too little or too much heat prevent an engine from giving peak performance. "Balanced cooling" protects and prolongs fine performance. For over 50 years, as specialists in radiator manufacture, we have been providing efficient "balanced cooling" systems for car, truck, bus, tractor, stationary and diesel engines. This lifetime of experience assures you unparalleled engineering design and production skill, and the widest range of radiator sizes and capacities.

LONG MANUFACTURING DIVISION, BORG-WARNER CORP. • DETROIT, MICH. and WINDSOR, ONT.

LONG

CLUTCHES • RADIATORS • TORQUE-CONVERTERS
OIL COOLERS

BW

American Helicopter Co. XH-26 "Jet-Jeep"

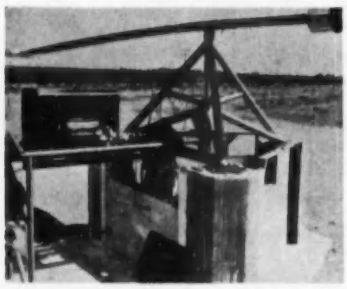
EMERY SOLVED THIS WEIGHING PROBLEM

FOR THE AMERICAN HELICOPTER CO., Mesa, Ariz.

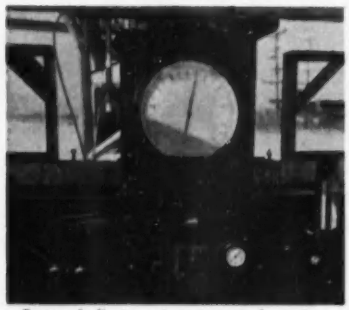
THE PROBLEM: Determine the thrust of rotor tip-mounted pulse-jet engines under simulated flight conditions.

THE SETUP: A single, counterweighted, main rotor blade with pulse-jet unit is mounted on a test stand. A Chrysler industrial engine, geared to rotate the blade under test, is mounted on a cradle suspended from two points on the centerline of its own drive shaft.

THE SOLUTION: Emery Closed Hydraulic Weighing System. An EC-30 Cell "weighs" the reactive torque developed between the Chrysler motor cradle and its support frame at any desired rotor speed. The industrial engine is then uncoupled from the rotor shaft, and the rotor turned by the pulse-jet unit at the same speed. The torque provided by the pulse-jet engine is the same (after correction for mechanical power transmission and other losses) as that required of the Chrysler engine to run the rotor at the given rate.



Pulse-Jet Rotor mounted on Test Stand



Emery Indicator at test control station

A 16 INCH, 0-1000 POUND Emery Bourdon Indicator is mounted with other instruments and controls at the operator's station beneath the test stand. The Emery indicator is calibrated in two-pound increments.

ACCURACY WAS PROVEN by American Helicopter Co. engineers, who found the Emery system provided thrust data whose error was less than 1%.

LET EMERY SOLVE YOUR WEIGHING PROBLEM

AT LOW COST for purchase and operation.

WIDE RANGE of stock sizes of Emery Closed Hydraulic, Hydraulic Flow, and Pneumatic Cells permit precision measurement of 1 to 100,000 pounds. Also special sizes up to 10,000,000 pounds.

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Max. load_____ % Accuracy required_____

Max. permitted response time lag_____

NAME_____

POSITION_____

(Please attach to your business letterhead)

THE A. H. EMERY CO. PRECISION SINCE 1872 FORCE MEASUREMENT

Barriers to U. S. Motor Vehicle Exports

(Continued from page 70)

down assembly business by 1956. The government hopes that locally-manufactured vehicles will have 50 per cent Indian components by then. However, no specific plans are being made to develop a parts industry to fill the expected gap.

The leading contender, farthest along on a local product with its 14 hp Hindustan, is now assembling Studebaker cars and trucks. It has technical agreements with Studebaker and British Motor Corp. (Morris).

Result of this government action is that the General Motors assembly plant in Bombay, largest automotive plant in the country, was closed on Mar. 31. Ford of Canada similarly announced it is closing its assembly plant shortly, for lack of parts. Three other assembly plants are expected to follow suit. Plans to continue operations by going to an expanded manufacturing program are expected from Indian-owned affiliates of Chrysler and Studebaker.

Indonesia

A graduated luxury tax, based on piston displacement, was put into effect on Jan. 1, 1953, for passenger cars five years old or less. Tax rates run from about $50 per year for 122-152 cu in. models to over $450 for cars with 244 cu in. engines and larger.

Import restrictions were relaxed slightly, however. All passenger cars for personal use with a cif price of $2100 or less now have only a 100 per cent surcharge. Those with a cif price of $2100-2400 remain at 200 per cent, while those above $2400 have no foreign exchange allocated.

Ireland

Quotas for assembled motor cars for 1953 were reduced some 40 per cent under 1952 quotas.

Japan

Despite restrictions to the sale of imported new American passenger cars to private citizens, several American firms have announced working agreements with Japanese manufacturers. These include Willys and Chrysler.

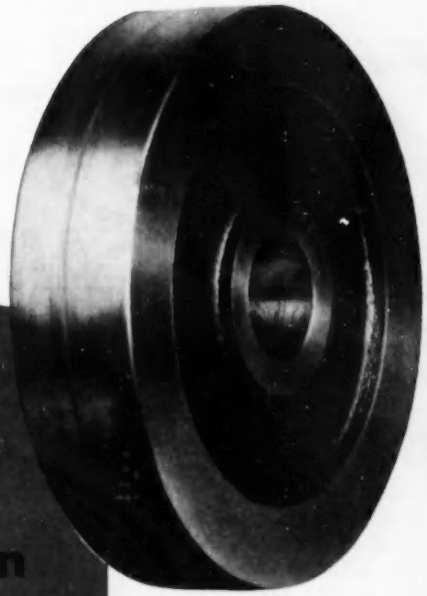
(*Turn to page 119, please*)

OHIO FORGE AND MACHINE

OHIO F&M CO

eliminates two grinding operations

machining high precision diesel engine gear blanks

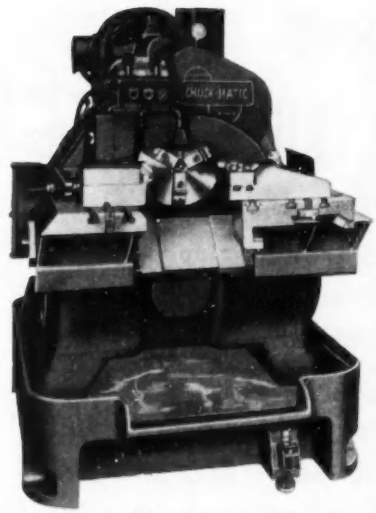


Machined on **CHUCK-MATIC** from A-4340 steel forging annealed.

1st operation: (on front side) Face hub and flange, form radius on O.D; bore and chamfer hole, turn O.D. partway.

2nd operation: (on other side) Face, finish bore and turn O.D. remainder.

ON ACME-GRIDLEY CHUCK-MATICS



Acme-Gridley 12″ Single Spindle CHUCK-MATIC is radically different from any other machine heretofore offered for short length primary operations such as forming, turning, drilling, straight or taper boring, facing, etc.

By switching these jobs to Chuck-Matics, Ohio Forge and Machine Corporation in Cleveland, Ohio, now machine tough forged blanks concentric within .0002″—hold tolerances which eliminate the green (or soft) grinds previously required on bore and O.D. before the teeth could be cut.

And they save, too, with automatic control of cycle time—a predetermined machining rate that you can count on for every piece.

This Radically Different Chucker

is built for high speed precision work on heavy duty jobs. Check these features against your present methods—

- **automatic control of machine time cycle**
- **easy to set up and retool**
- **does not require skilled labor—one man operates as many machines as cycle times of jobs permit**
- **is space saving—only 45″ wide, 64″ long**
- **precision work at speeds and feeds as fast as carbide tools can take it.**

—then write for catalog SC-46. Or, better still, ask us to talk it over.

Nothing so completely destroys profits as the continued use of obsolete equipment

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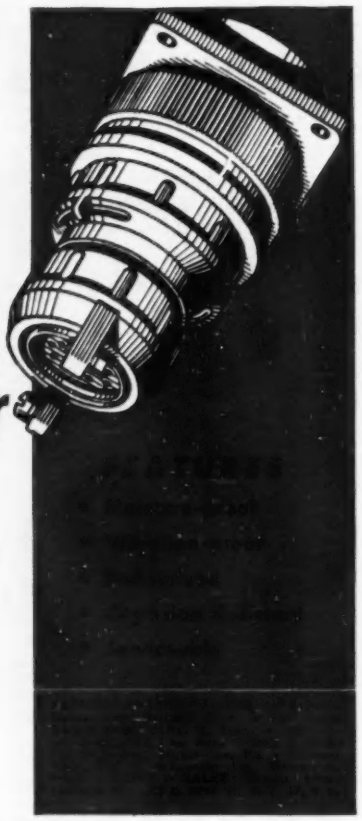
ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

Engineered for
Extreme
Efficiency

the NEW AN-E

Environment Resistant Bendix Electrical Connector



The challenge to protect sensitive airborne electronic circuits from thermal shock, surface condensation and extreme vibration has been successfully met by Bendix engineers in this new spaced grommet "E" connector.

This connector is not only designed for performance, but is also engineered for your production needs. The open space in the solder-well area provides ample room for all assembly and soldering operations. Moisture-proofing is accomplished without the use of potting compounds, permitting completely serviceable aircraft harness installations.

These features are all accomplished with no appreciable increase in weight over an AN-A/B connector with a cable clamp.

Complete information on request.

Bendix **SCINTILLA DIVISION of Bendix**
SIDNEY, NEW YORK — AVIATION CORPORATION

FOR 74 YEARS

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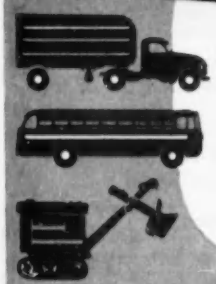
HAS SOLVED MANY EQUIPMENT PROBLEMS REQUIRING SPECIAL
SPRINGS



Since 1880 Tuthill has specialized in designing springs to fit every specific need. Whether your spring requirements are for trucks, buses, automobiles, trailers, farm wagons or dual and triple axle heavy-duty jobs — Tuthill can meet them quickly and economically. And now, MOLYBDENUM DISULPHIDE (MoS_2) . . . the newest Tuthill extra that keeps springs from *squeaking* and *galling*, is an added Tuthill feature that distinguishes this famous line.

Whatever your spring requirements may be — see Tuthill first!

TUTHILL SPRING CO.
760 West Polk Street — Chicago 7, Illinois

Multiform STEEL RULE Dies — STEEL RULE — SINCE 1900

LET US SOLVE YOUR
DIE-CUTTING PROBLEMS
WITH RICHARDS' "TOUGH TEMPER"
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HEADQUARTERS SINCE 1900
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J. A. RICHARDS CO. 903 N. PITCHER
KALAMAZOO, MICH.

Barriers to U. S. Motor Vehicle Exports

(*Continued from page* 116)

Mexico

Quotas for assembly of trucks in the last half of 1953 were raised slightly. Quotas originally were requested by the distributors, who feared overproduction after the record year of 1951, in order to protect their limited credit. But some quarters believe output of trucks is not sufficient to fill the demand.

Passenger car quotas remained the same, about half the 1951 peak. (Nearly all new trucks and cars are locally assembled, except for substantial numbers which are said to enter illegally.)

Tariffs were raised last year on assembled pasenger cars and buses, but lowered on trucks of types not assembled in Mexico.

Netherlands

An increase in imports from the U. S. can be expected since the rate of exchange of the bonus dollar declined recently to only 10 per cent above the normal rate of exchange. Using normal exchange, the importer still must obtain a license, which is good only for vehicles costing less than $1350 fas New York.

The truck import quota for 3½ to seven ton vehicles was raised about a year ago, ending the protection previously given the DAF concern. Production of DAF trucks has increased to the point where, in spite of a huge government commitment, about one-fourth of total civilian production is being exported.

Pakistan

In his remarks at the opening of the new General Motors assembly and manufacturing plant on July 4, 1953, the Prime Minister stated it is the government's policy to encourage foreign capital investments. Restriction on imports, made necessary recently by the lower demand for Pakistan's raw materials, will be relaxed when the exchange position improves. He emphasized the country's need for cheap transportation.

Much of the data for this article was taken from U. S. State Dept. reports, as furnished by Business and Defense Services Administration, Department of Commerce.

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NATIONAL PLASTICS EXPOSITION
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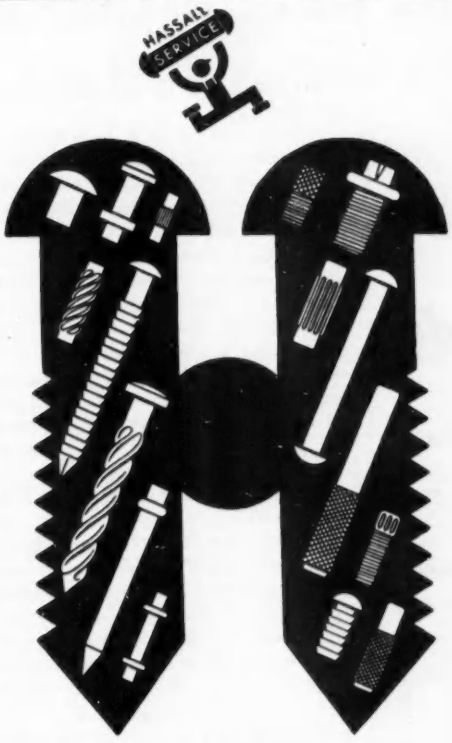

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MOLY

AI-4 MS-6A

Aluminum Trailer

(*Continued from page* 96)

and riveting it from roof to rubrail down both sides. This provides a box-sectioned post every 18 in. to give a strong and stiff sidewall.

Also an integral part of the sidewall construction are 36 in. aluminum wear strips. These are plug sealed to prevent dirt from getting behind the strips. The rivets are driven from the outside with their smooth heads on the inside of the van to prevent cargo damage.

The inside of the nose of the trailer is practically square for solid loading of cartons and other flat cargo. This has been accomplished by continuing the smooth, rounded corner sections outside the corrugated sections of the nose. The interior is illuminated by outside light through molded plastic fiber glass front corner roof caps.

Structural improvements also have been provided which give increased cubeage and also greater floor support. Gross-members 10⅜ in. deep are located on 18-in. centers with shallower boxed or hat-shaped cross-members over the upper coupler and underconstruction to make possible a lower floor.

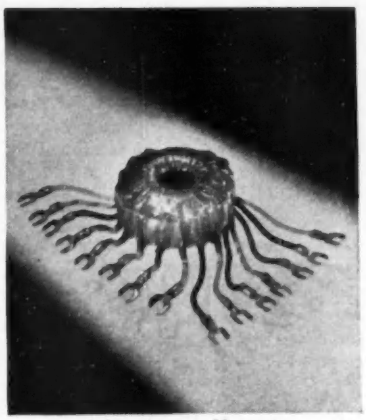
The thinner roof has 1¼-in. aluminum I-beam bows with ½ in. crown for good drainage. The roof is full floating with clincher strips laid directly over roof bows for greater strength.

An improvement has been made in the upper coupler construction. It has shallower backing than previously, the cross-members being shallower to lower the floor. All cross-members are boxed sectioned lengthwise, crosswise and diagonally. The coupler plate itself serves as a bearing plate and does not take the load as the king pin is mounted in a substantial casting which is welded directly to the box member structure. As a result of this type of construcion the drawbar pull and braking forces are carried directly into the longitudinal members and box-type cross-members.

In addition to the corrugated aluminum trailer, a new platform-type trailer is just being introduced by Fruehauf. This new model is distinguished by its ability to carry heavier and more concentrated loads without the use of trusses or heavy side rails. It is estimated by Fruehauf engineers that the new type construction will save as much as 600 lb per unit.

One of the key features of the new

New heart for servo systems



Airborne's saturable reactor

This toroid, produced in our plant as part of a magnetic amplifier, was developed by our Control Engineering group. It is typical of the custom design work they do.

Designed for a flight control system utilizing artificial "feel," our magnetic amplifier depends neither on fragile vacuum tubes nor delicate relays. It is simple, and when fixed in a thermosetting compound, impervious to shock. Also important, it is Airborne engineered for Airborne-actuated control systems.

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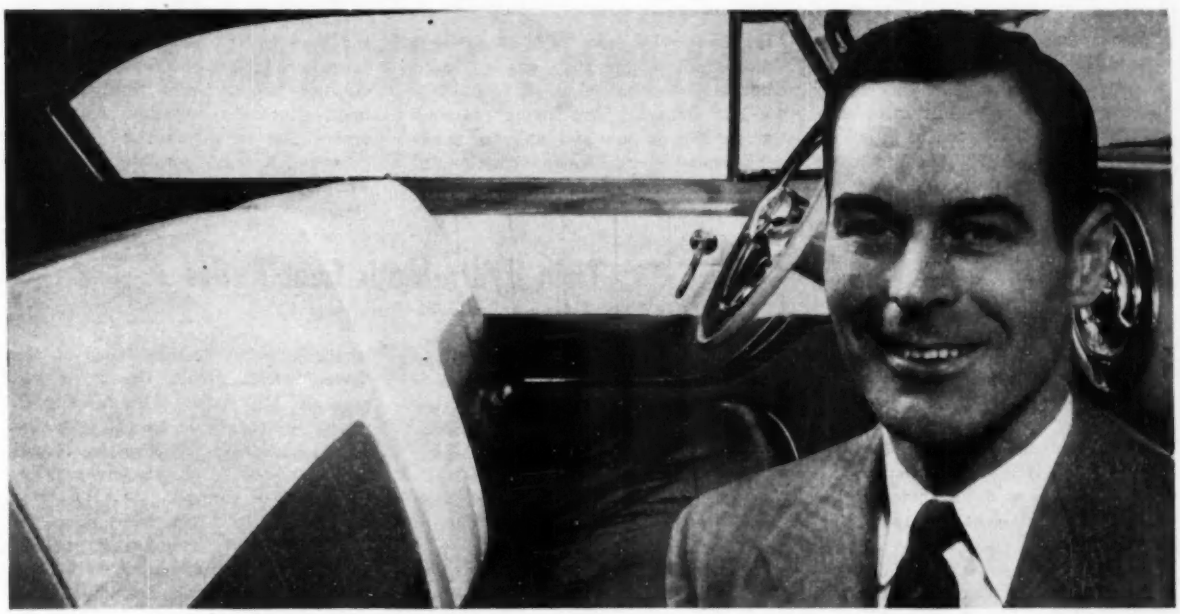

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Genuine upholstery leather costs little more than good seat covers . . . takes hard wear in stride and actually *improves* with age. It's the ideal car upholstery because it is always easy to "slide" on, resists hot sunlight and bad weather, holds its color and beauty for years without fading. Leather is always comfortable —becomes softer and more pliant with age— develops a rich patina that distinguishes it from any substitute. And genuine upholstery leather means a higher trade-in value. Sales reports show that it increases the resale value of any car. Nothing adds luxury, value and profit to a car like leather. Why sell less?

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platform unit is the use of new die-formed 16-in. deep main members of exceptional strength and lightness for all lengths and types. It includes a universal gooseneck made in ⅝-in. and 7/16-in. thickness. This is cut to various lengths to fit single axle and tandem tractor installations.

Lights and reflectors on the front corners are recessed for protection against breakage or damage. They are the new metal-framed reflectors which are now standard for Fruehauf van and platforms.

The flooring can be as desired for the purposes to which the platform unit is to be used.

A number of other new features will be standard production in all truck-trailer models. Included in the changes are new wheels, brakes, improved vertical supports, an air spring suspension for tandem tank-trailers and improvements in details of construction of the GT (gravity-tandem) suspension.

The new wheels are five-spoke type in place of the previous six-spoke. The net result is a weight saving with no loss in strength and rigidity.

Offered as optional equipment is a new extra heavy-duty brake for mountain hauling operations. These new brakes provide from 24 to 27 per cent more lining area than the standard brakes.

The General "Air-Spring" tandem suspension is now available for tank-trailers which require an exceptionally soft ride. Air pressure in this suspension automatically varies to suit the load so that a soft ride is obtained even when the tank is running empty. The fact that the height remains constant whether empty or loaded due to variable air pressure, permits lowest possible mounting with minimum provisions for tire clearance.

Twin Hydra-Matic Gear Ratios

(Continued from page 51)

indicate the road speeds at which the maneuvers will take place under conditions of maximum throttle.

Referring to this chart, consider the first column at the left which covers the start in creeper range, then a shift into direct. It will be noted that in this instance the automatic drive will go through to its 7th gear, then will shift right into second when the driver shifts into direct. From this point on the drive is direct and the transmission will automatically complete its shifts to 7th position, assuming full throttle conditions. This maneuver carries through 13 gear shifts.

The next column covers a start in low and a shift to direct or high. Here the main drive will shift automatically through 7th position, then as the driver selects direct, the drive will pick up 5th speed automatically in direct, and continue its shifts to the 7th position with full throttle. It will be noted that this maneuver takes only ten gear changes.

The start in direct, when it can be done effectively, assumes light load and favorable grade or a start on a down grade. Here the maximum gear shifts are held to seven.

Attention is directed particularly to the "hold" position, a new maneuver that makes possible the most efficient and most economical operation of the vehicle. It has at least two major functions. For one thing, it prevents upshifting of the transmission when depending upon down grade braking. On a long, steep grade the driver moves the quadrant lever to hold position and the transmission will remain locked in the gear engaged at the time. While in this position it will downshift to a lower gear if a downshift point is reached. It will then hold in this position until the next downshift point is reached, assuming that the vehicle is constantly decelerating.

An upshift in the hold position will occur whenever engine speed increases 300 rpm above engine governed speed —in this instance at 2600 rpm.

Another major feature of the hold position is that it serves to raise the downshift point in all gears, thus contributing to an improvement in driving conditions, permitting maximum headway at all times. Consider the vehicle running in direct on a level stretch while approaching a steep grade. Here it is expedient for the driver to pre-select the maneuver by moving the pre-select lever to hold position before the grade is reached. This will raise downshift points to a maximum. When the grade is reached and vehicle speed begins to drop, downshift will occur, returning the engine to governed speed at the next lower gear. This permits the engine to operate at maximum horsepower under most economical conditions. These downshifts will occur automatically until first gear is reached.

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and molded diaphragms for

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The new Mechanical Products Division of Haartz-Mason Inc. has been formed to produce a complete line of quality coated fabrics and molded diaphragms. Twenty-eight years' experience in the manufacture of precision coated fabrics now combine with new production techniques and equipment to produce products incorporating:

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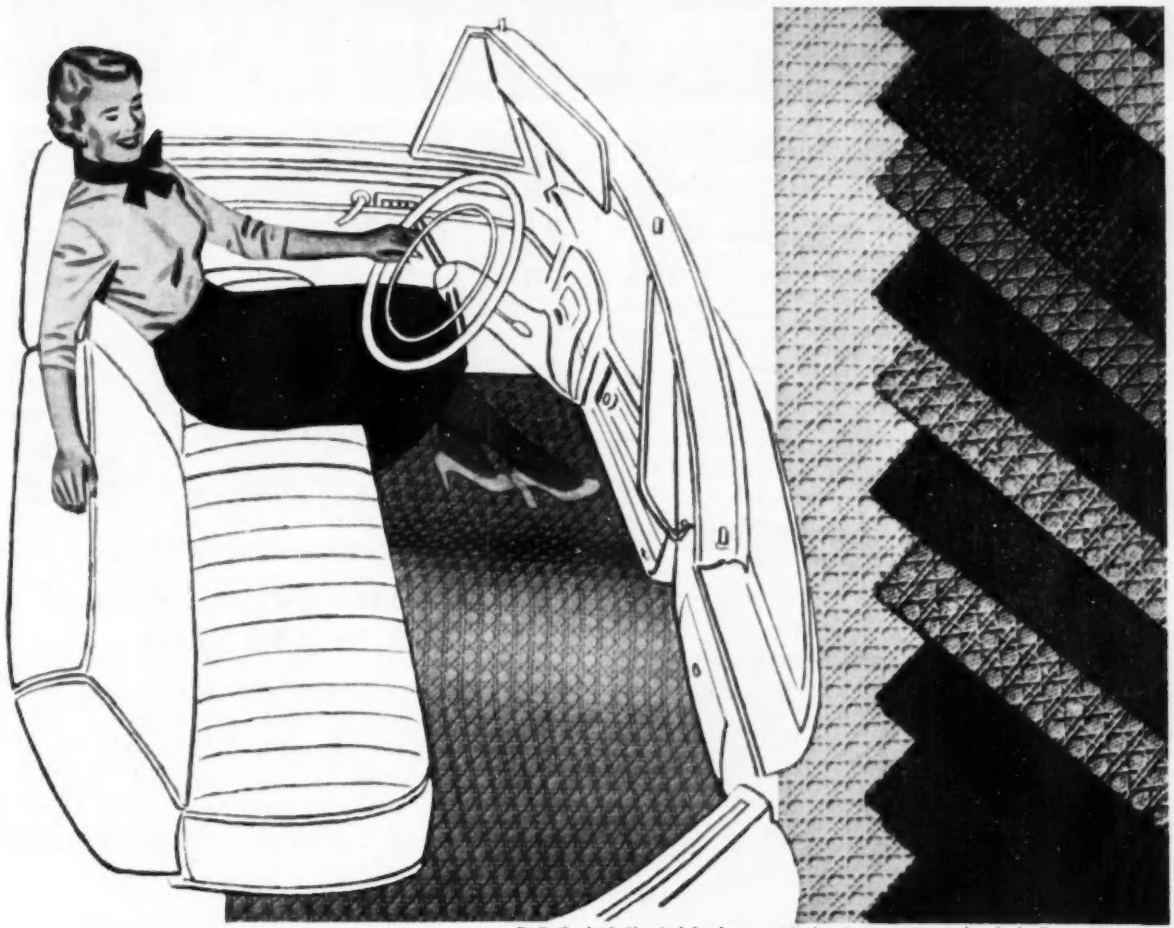
B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Co. does not make these floor mats. We supply only the Geon polyvinyl latex.

Car floor styling hits new high!

IT had to come—textured floor mats in color to match the brilliant color of today's cars.

The manufacturer of these floor mats coats rubber with a special formulation of Geon polyvinyl latex, and at one stroke offers wide color range and extra wear—up to 4000% more! On top of that, the motorist gets easier cleaning and high oil-and-grease-resistance. No wonder so many new cars are equipped with this advanced floor mat made possible by one of the many Geon polyvinyl materials.

If this new sales-maker gives you an idea for developing or improving products with Geon materials, check with us—for Geon is used in many products from wire insulation and durable flooring to upholstery, rigid tubing and sponge.

We'll help you select the Geon material best suited to your needs. Write Dept. GR-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

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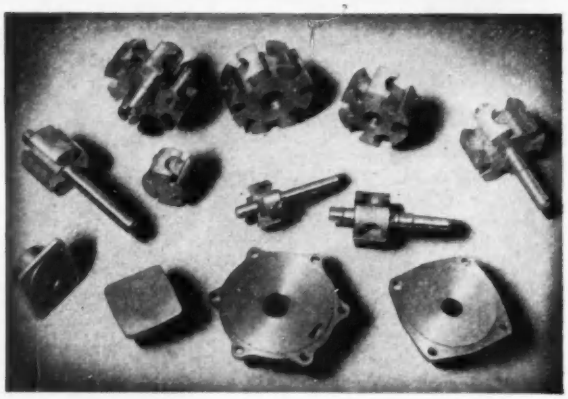
Typical Examples of "Small Lot" Turning . . . . .

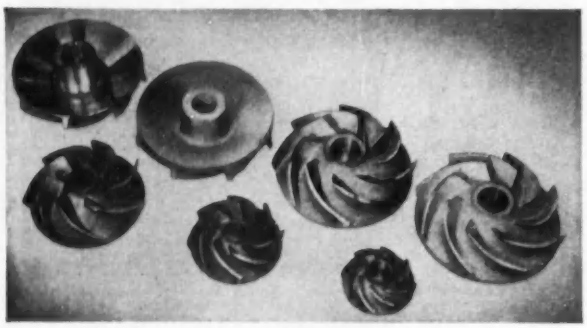
WHY THEY CAN SUNDSTRAND

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only three of the many users of this modern equipment. All of the advantages of multiple-tool turning are available on both small lot and mass production work. Study these brief examples and compare the production figures with parts similar to yours . . . then get the whole story for equivalent or better savings on turning work in your own plant.



Production Increased 2-1/2 Times On Lot Sizes of 100 to 500 Parts

Parts are pump rotors and covers. Previously these parts were turned on three conventional turning machines using three operators. A Sundstrand Model 8A Automatic Lathe does the same work 2½ times faster with one operator. Operations include facing, turning and core drilling. Production on cast-iron parts is 120 per hour.

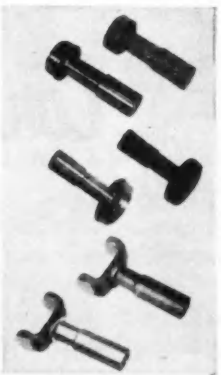


13 Hours Saved On Each Lot of 20 Impellers

Parts are bronze, range in size from 4" to 10" in diameter. Parts were formerly machined in three operations and three set-ups in 15 hours. Same amount of machining is done in two set-ups on Sundstrand in 2 hours. Turning convex and concave shapes and boring center hole comprise operations.

Production Increased 70% On 12 Different Jobs

Here are "before" and "after" illustrations of three of 12 different turning jobs on a Model 12A Automatic Lathe. Operations include turning, facing and chamfering. Production increases average from 65% to 70%.



SUNDSTRAND "Engineered Production" Service*

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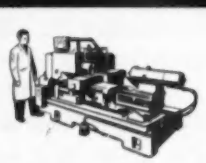
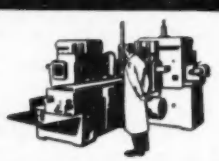
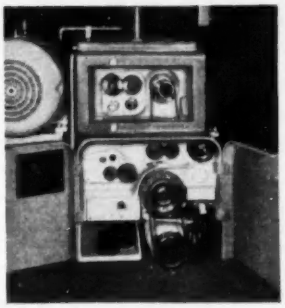
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





BE HANDLED PROFITABLY ON AUTOMATIC LATHES

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

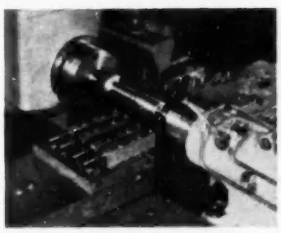


Note convenient location of speed and feed change gears for quick change over.

Wide Range of Tool Action

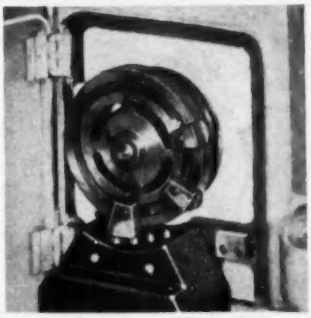
Straight feed-in type carriage with slow up and dwell and tool relief provides wide range of action for front tools. Many cycle combinations are possible by merely making simple adjustments.

Universal Tooling Handles Wide Range Of Parts

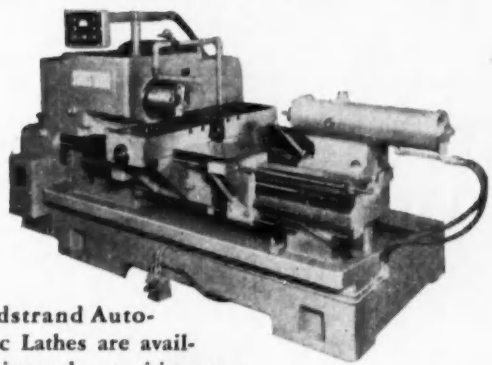


Illustrated at right are Sundstrand universal tool blocks which are quickly and easily positioned for many different jobs. Setting tools to master samples is one method of reducing set-up time. There are many others. Sundstrand engineers are available to assist you in analyzing and making suggestions for the most profitable tooling for your turning production. Call on them without obligation.

Quick Cycle Change for Faster Set-Ups



Complete control of all cycles is provided by adjustment of dogs on a disc as shown in illustration at right. Making cams is eliminated. Changing position of dogs on disc changes length of rapid approach, feed and rapid return stroke — enables operator to set up cycle quickly and change over from one job to another easily.

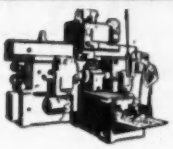


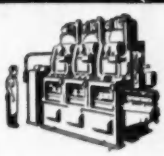
Sundstrand Automatic Lathes are available in work capacities ranging from 5 to 75 HP and in varying speed combinations and lengths. Shown above is a Model 12A Automatic Lathe with 50 HP spindle drive motor.

Free Data

Complete information on Sundstrand Automatic Lathes can be obtained from these booklets. Ask for bulletin 242.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





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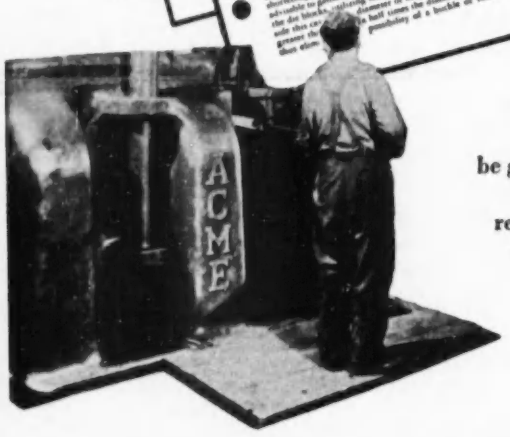
Machine Tool Co.
2571 Eleventh St. • Rockford, Ill., U.S.A.

aids

TO MODERN FORGING PRACTICE



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MEMO

FROM: Engineering
TO: Purchasing

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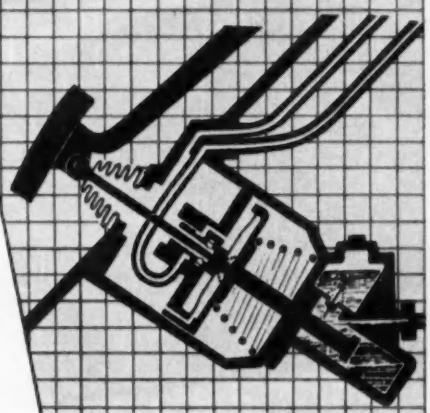
Jim

P.S. Ask about weather-stripping cement, too--



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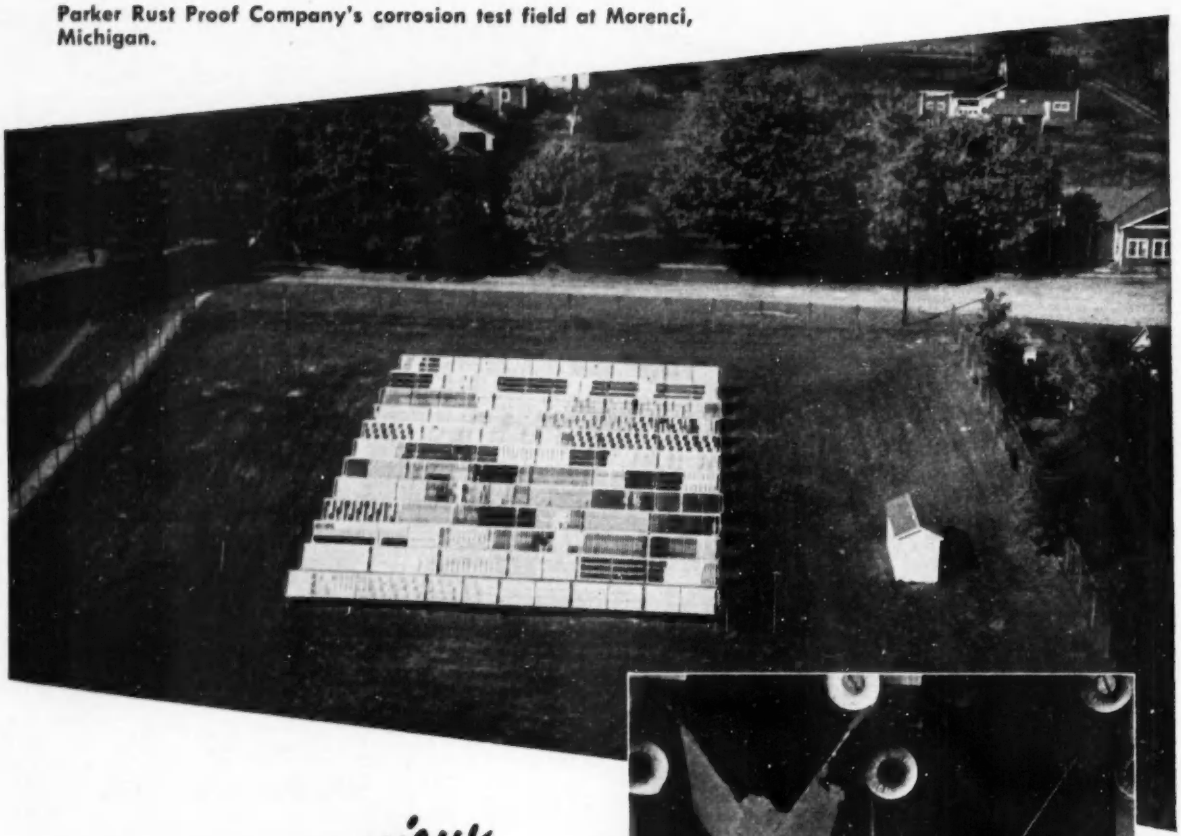
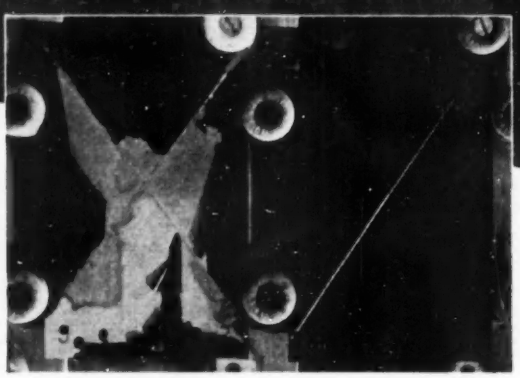
Parker Rust Proof Company's corrosion test field at Morenci, Michigan.



Birds-eye view of a strange crop



What weather does to finishes! Panel left, paint over untreated aluminum. Panel right, paint over Bonderite-treated aluminum. 11 months outdoor exposure.

A crop of 6,400 metal panels is tended in Parker Rust Proof's outdoor test field. The harvest is facts on the durability of various finishes over various metals.

Conditions here are the same as are met by painted products in daily outdoor use. The sun and the wind, the rain, sleet and snow pound at these panels continually. Parker technicians watch each set of panels individually, observe their condition, chart results at regular intervals.

This large-scale outdoor testing program, continuous since 1935, has helped build Parker's great fund of valuable information on how to control corrosion. The facts we learn from the corrosion test field are passed on to guide our customers to more effective, more economical surface treatments for metals.

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

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BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE
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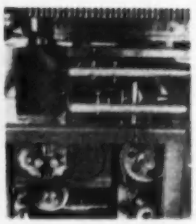
MAINTENANCE-FREE CARRIER CHAIN INDEXING

The Ferguson Roller Gear Drive, utilized to index carrier chains, is designed to operate up to 20,000 hours with almost no maintenance and then may be renewed inexpensively merely by replacing standard ball bearings.



One of the nation's largest manufacturers of automotive electrical parts employs a 4-stop, 300° indexing period Drive in their straight line machines devoted to sub-assembly operations. They find that the inherently versatile design characteristics of the Drive and its smooth acceleration and deceleration greatly facilitates the use of the machine for many different types of operations.

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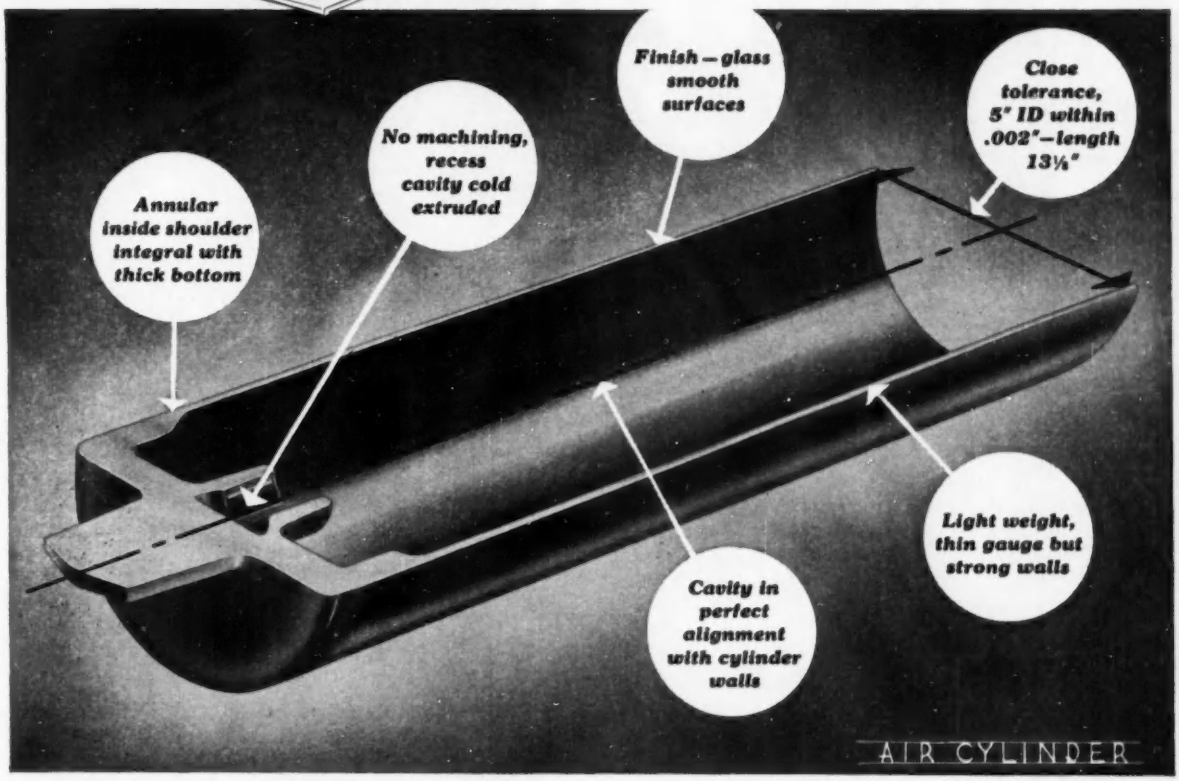
Zollner Machine Works ..... 3rd Cover

Now Mullins Koldflo makes your dream design practical


Finish — glass smooth surfaces
Close tolerance, 5" ID within .002"—length 13¼"
No machining, recess cavity cold extruded
Annular inside shoulder integral with thick bottom
Light weight, thin gauge but strong walls
Cavity in perfect alignment with cylinder walls
AIR CYLINDER

Mullins *Koldflo* makes this finished part in one piece... *without machining*

- **You can now design intricate parts the way you want them — without compromise**
- **You can add important new sales features**
- **And Mullins Koldflo design cuts your costs**

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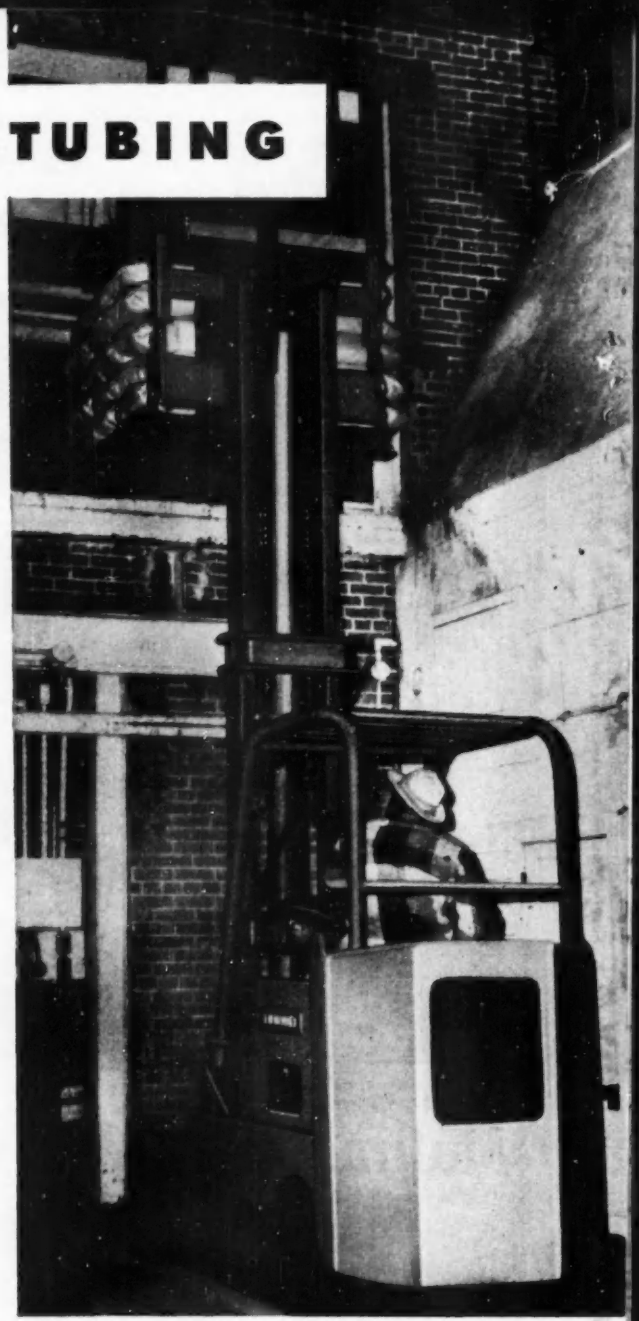
LIFT

IN LIFT TRUCKS



● The Towmotor is one of the most rugged top-performing lift trucks in the country. And the lift mechanism of the Towmotor features a standard mast which provides the highest free lift—25½"—in the industry. The model shown here has a 6000 lb. capacity at 24" load center. Key to this powerful, fast-hoisting action is the hydraulic hoist cylinder—the assembly that puts the "lift" into every load hoisted by the Towmotor. That hoist cylinder is fabricated from Shelby Seamless Mechanical Tubing.

Shock-absorbent Shelby Seamless Tubing combines to the highest degree the desirable qualities of strength, safety and workability. It is uniform throughout, dimensionally accurate, and possesses excellent machining and superior welding properties.

Shelby Seamless is produced to exacting standards by the world's largest manufacturer of tubular steel products. It is available in a wide range of diameters, wall thicknessess, various shapes and steel analyses. Please feel free to call on our engineers at any time. They will be glad to submit recommendations based on a study of your particular requirements.

All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

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4-1050

UNITED STATES STEEL

Sensational Piston Performance

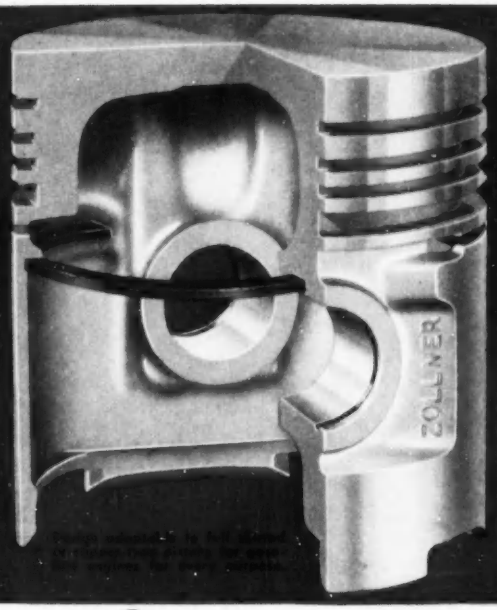
UNIFORM CLEARANCE AT ALL TEMPERATURES

STEEL TENSION MEMBER

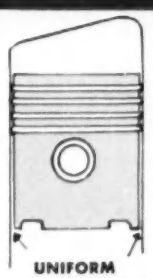
Anchored only at pin bosses and cast in positive contact with I. D. of piston skirt

Controls Clearance Automatically

ZOLLNER CLEAR-O-MATIC PISTONS



Now, pistons may be fitted to closer clearances than ever before possible. The sensational development of CLEAR-O-MATIC Pistons by Zollner engineers *reduces required clearance to less than .001 with constant uniformity of skirt bearing over the entire temperature range.* Performance results are spectacular. Engines run quietly with no cold slap. Friction is reduced without loss of durability or heat conductivity. There is no danger of scuffing or seizing. The Zollner designed steel tension member incorporates in the aluminum piston the same effective expansion as the ferrous cylinder itself. We urge your immediate test of these sensational advantages for your engine.



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1. Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
2. Effective expansion identical with ferrous cylinder.
3. Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
4. Normal diametric clearance usually less than .001 with uniform skirt bearing.
5. Durability and conductivity comparable to heavy duty design.

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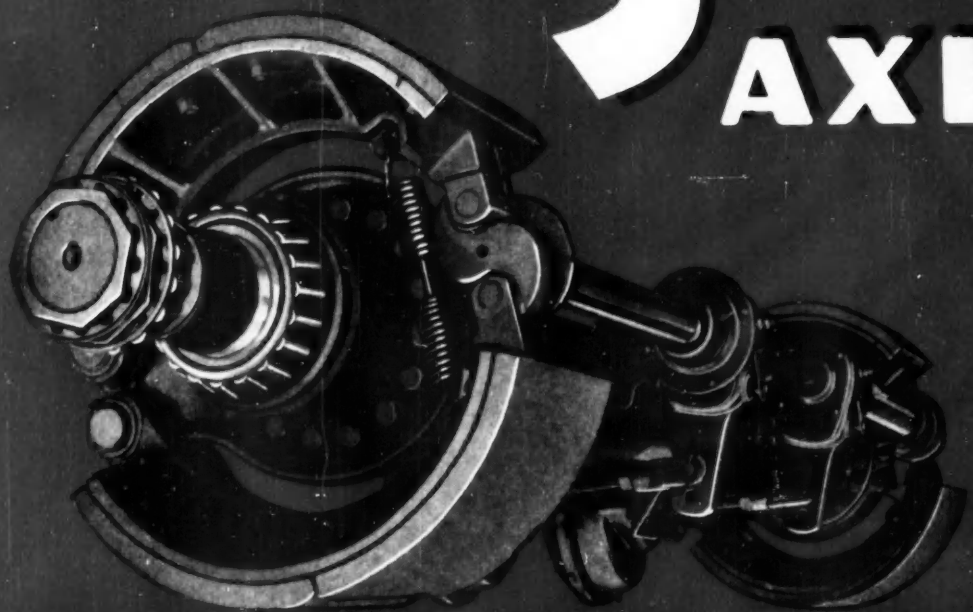

For many years manufacturers of the world's finest axles*, the Shuler Axle Company now looks forward to even greater service to the industry, as a part of the Fuller Manufacturing Company.

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